LAKE ONTARIO FISH COMMUNITIES AND FISHERIES:

2011 ANNUAL REPORT OF THE LAKE ONTARIO MANAGEMENT UNIT

LAKE ONTARIO FISH COMMUNITIES AND FISHERIES:

2011 ANNUAL REPORT OF THE LAKE ONTARIO MANAGEMENT UNIT

Prepared for the
Great Lakes Fishery Commission
2012 Lake Committee Meetings
Windsor, ON CAN

March 19-23, 2012

© 2012, Queen's Printer for Ontario
Printed in Picton, Ontario, Canada

March 2012

Report ISSN 1201-8449

Please cite this report as follows:
Ontario Ministry of Natural Resources. 2012. Lake Ontario Fish Communities and Fisheries: 2011 Annual Report of the Lake Ontario Management Unit. Ontario Ministry of Natural Resources, Picton, Ontario, Canada.

Report available on the following website:
http://www.glfc.org/lakecom/loc/mgmt_unit/index.html

TABLE OF CONTENTS

Foreword v

1. Status of Major Species

1.1 Chinook Salmon 1
1.2 Rainbow Trout 1
1.3 Atlantic Salmon 1
1.4 Lake Trout 1
1.5 Lake Whitefish 1
1.6 Northern Pike 2
1.7 Muskellunge 2
1.8 American Eel 2
1.9 Smallmouth Bass 2
1.10 Largemouth Bass 2
1.11 Panfish 3
1.12 Yellow Perch 3
1.13 Walleye 3
1.14 Prey Fish 3
1.15 Round Goby 3

2. Index Fishing Projects

2.1 Ganaraska Fishway Rainbow Trout Assessment 4
2.2 Eastern Lake Ontario and Bay of Quinte Fish Community Index Gillnetting 7
2.3 Eastern Lake Ontario and Bay of Quinte Fish Community Index Trawling 23
2.4 Lake Ontario Nearshore Community Index Netting 36
2.5 Lake-wide Hydroacoustic Assessment of Prey Fish 44
2.6 St. Lawrence River Fish Community Index Netting—Thousand Islands 46
2.7 Credit River Chinook Assessment 49
2.8 Juvenile Atlantic Salmon Parr Survey 50
2.9 Credit River Atlantic Salmon Smolt Survey 51
2.10 Credit River Fishway Atlantic Salmon Assessment 55

3. Recreational Fishery Surveys

3.1 Western Lake Ontario Boat Angling Fishery 57
3.2 Chinook Salmon Mark and Tag Monitoring 59

4. Commercial Fishery

4.1 Quota and Harvest Summary 62
4.2 Lake Whitefish Commercial Catch Sampling 73

5. Age and Growth Summary 76

6. Contaminant Monitoring 77

7. Stocking Program 78

8. Biodiversity and Species Rehabilitation

8.1 Introduction 88

8.2 Atlantic Salmon Restoration 88
8.3 American Eel Restoration 91
8.4 Lake Trout Restoration 94
8.5 Deepwater Ciscoes Restoration 95
8.6 Round Whitefish Action Plan 95
8.7 Non-native Species Update—Round Goby and Chain Pickerel 96

9. Management Planning

9.1 Fisheries Management Zone 20 Council (FMZ20) 97
9.2 Lake Ontario and St. Lawrence River Commercial Fishing Liaison Committee 97
9.3 Fisheries Management Plans 97

10. Research Activities

10.1 Ecology of *Hemimysis* in the Lake Ontario ecosystem 99
10.2 Lake Trout Response to Ecological Change in Lake Ontario 102
10.3 Project Quinte 104
10.4 Eastern Basin Limnology (Station 81) 104

11. Partnerships

11.1 St. Lawrence River Seine Netting and Muskellunge Nursery Site Identification 106

12. Staff 2011 107

13. Operational Field and Lab Schedule 2011 109

14. Primary Publications 2011 110

Lake Ontario Fish Communities and Fisheries: 2011 Annual Report of the Lake Ontario Management Unit

---

Foreword

The Lake Ontario Management Unit (LOMU) is pleased to release its Annual Report of assessment and management activities carried out during 2011.

Lake Ontario fisheries are managed by MNR in partnership with New York State within the Lake Ontario Committee under the Great Lakes Fishery Commission. Lake Ontario Fish Community Objectives provide bi-national fisheries management direction to protect and restore native species and to maintain sustainable fisheries. Our many partners include: New York Department of Environmental Conservation, Canadian Department of Fisheries and Oceans, the U.S. Fish and Wildlife Service, and many other Ontario provincial ministries and conservation authorities, and U.S. state and federal agencies and non-government partners.

The Lake Ontario, Bay of Quinte and St. Lawrence River ecosystem has changed over the last two centuries in response to the pressures of land settlement and agricultural practices, industrial development, pollution, fishing, loss of native species, and the introduction of new species. Fisheries monitoring, assessment and research programs help understand these changes and support informed management decisions that consider the ecological realities that shape the fishery, such as the natural capacity of the lake to produce fish, the decline or recovery of native species, the impact of non-native species, changes to fish habitat and climate change, along with social and economic objectives.

Management highlights from 2011 include the commissioning the Ontario Explorer in June, the Lake Ontario Trout and Salmon Symposium, and the ongoing delivery of the LOMU fisheries assessment program and continued progress to restore native species. The Ontario Explorer, our new 65 foot assessment vessel was used in 2011 for hydroacoustic work to assess prey fish abundance, deep water trawling and index netting, offshore food web assessment and limnology. The Lake Ontario Trout and Salmon Symposium was a great success with over 300 anglers attending. The event was only possible because of leadership and support from the Port Credit Salmon and Trout Association and the Credit River Anglers Association.

We express our sincere appreciation to the many partners and volunteers who contributed to the successful delivery of LOMU initiatives. LOMU gratefully acknowledges the important contribution of the Lake Ontario Commercial Fishing Liaison Committee, the Fisheries Management Zone 20 Council (FMZ20) members, the Ringwood hatchery partnership, Chinook net pen program, Ganaraska fishway volunteers, Muskies Canada and the participants in the angler diary and assessment programs.

Our team of skilled and committed staff delivered an exemplary program of field, laboratory and analytical work that will provide long-term benefits to the citizens of Ontario. We are pleased to share the important information about the activities and findings of the Lake Ontario Management Unit from 2011.

Andy Todd
Lake Ontario Manager
613-476-3147

For more detailed information or copies of this report please contact:

Lake Ontario Management Unit
Ontario Ministry of Natural Resources
R.R. #4, 41 Hatchery Lane
Picton, ON K0K 2T0 CAN
Telephone: (613) 476-2400
FAX: (613) 476-7131
E-mail: linda.blake@ontario.ca

1. Status of Major Species

The following is an overview of the status of major species in Ontario waters of Lake Ontario for 2011. The overview draws largely upon information presented in the chapters and sections that follow in this report. The fish communities of Lake Ontario continue to respond to changes in the ecosystem attributed to the effects of dreissenid mussels and other stresses.

1.1 Chinook Salmon

Condition of age-2 and age-3 Chinook Salmon in the Credit River declined sharply in 2011 and was among the lowest values since 1989 (Section 2.7). The percentage of wild Chinook Salmon (as opposed to stocked fish) ranged from 35-40% in Lake Ontario index gillnets and angler catches for the 2008, 2009, and 2011 year-classes but was 66% for 2010 year-class (Section 3.2). In contrast, no wild Chinook Salmon were observed in the Credit River. Lamprey marking on Chinook Salmon in the Credit River declined to very low levels (Section 2.7).

1.2 Rainbow Trout

Rainbow Trout abundance in Lake Ontario has increased. In 2011, the spring run of wild rainbow trout at the Ganaraska River fishway increased to its highest level since 1996 (Section 2.1). Rainbow Trout catch rates in Lake Ontario angler surveys were the highest since 1993 (Section 3.1). Condition of Rainbow Trout in the Ganaraska River in 2011 was unchanged from 2010, and was close to the long term average (Section 2.1). Lamprey marks on Rainbow Trout in the Ganaraska River continued to decline but still remain a concern as levels were comparable with the 1970s before lamprey control (Section 2.1).

1.3 Atlantic Salmon

More than 3.5 million Atlantic Salmon (various life stages) have been stocked since the Lake Ontario Atlantic Salmon Restoration Program began in 2006. Three hatchery broodstocks from different source populations in Nova Scotia, Quebec and Maine have been established. Stocked juveniles are growing and surviving well in the streams and good evidence of smolt production has been documented (Section 2.8 and Section 2.9). Sizeable numbers of returning adults have been observed in streams from 2008 through 2011 (Section 2.10). Measures continue to be taken to improve access to upstream spawning habitat through the removal or modification of barriers and installation of fishways. Although the presence of Atlantic Salmon in the Lake Ontario boat fishery remains low, catch rates over the past several years are amongst the highest on record. Although it is still early in the program, progress towards restoration of Atlantic Salmon, to date, has been encouraging (Section 8.2).

1.4 Lake Trout

The abundance of adult Lake Trout has been increasing in recent years but it is still low compared to levels seen in early 1990s (Section 2.2 and 8.4). The increase is likely due to improved early survival of stocked fish, however, early survival dropped sharply in the last two years. It remains to be seen whether this is just a temporary setback.

1.5 Lake Whitefish

Abundance of Lake Whitefish in assessment gillnets is very low (Section 2.2). Many strong year-classes produced in the late 1980s and early 1990s are aging and declining in both assessment gillnets (Section

2.2) and commercial gear (Section 4.2). Reproductive success was very low after the mid 1990s until a strong year-class was produced in 2003 (Section 2.3). Growth of these young fish is slow and age-at-maturity is delayed by at about two years. The condition of Lake Whitefish caught in summer assessment gillnets (Section 2.2) improved after the mid to late 1990s but condition of fish caught during the fall remained low (Section 4.2). Commercial Lake Whitefish harvest in 2011 (78,211 lb) was up significantly compared to 2010 due primarily to increased fishing effort and higher catch rates (Section 4.1 and 4.2).

1.6 Northern Pike

Northern Pike, while not abundant in the open waters of Lake Ontario are common in many embayment and nearshore areas (Sections 2.2, 2.3 and 2.4). Northern Pike are also common in the St. Lawrence River although their abundance trend shows a gradual, long-term decline (Section 2.6).

1.7 Muskellunge

The Muskellunge is an important native species and top predator in the St. Lawrence River ecosystem. A significant mortality event in the spring of 2005 and 2006, related to viral hemorrhagic septicaemia (VHS), has caused concern over the status of St. Lawrence River Muskellunge. MNR is examining Muskellunge management options with the FMZ20 Council which may include increased minimum size limits, to protect large spawning fish, and public education. MNR is continuing to work with partners to identify and protect Muskellunge spawning and nursery habitats in the St. Lawrence River (Section 11.1)

1.8 American Eel

The total number of eel migrating upstream at the ladders, located at the Moses-Saunders Hydroelectric Dam on the St. Lawrence River has been increasing since 2001; however, the number is still less than 8% of the migrations observed during the 1970s and 1980s. Even with the closure of the commercial fishery (2004) and the stocking of over 4-million glass eels during 2006-10, the long-term indices of abundance of large yellow eels in the Lake Ontario/upper St. Lawrence River ecosystem remains low. There was no eel stocking during 2011 but initial results suggest that eels stocked in previous years are surviving well, growing quickly, and dispersing widely from stocking sites. Some stocked eels are maturing into males and migrating at a small size; this has not been observed before. Ontario is continuing to work with other management agencies and stakeholders to encourage the safe passage of eels around hydro dams. OPG conducted a pilot project to trap large yellow eels and release them below all barriers to downstream migration. Preliminary results of this project suggest that some of the transported eels do migrate towards the spawning grounds which should contribute to the global spawning stock. Sustainable management practices throughout the range of this panmictic species will be required to restore eel abundance in North America (Section 8.3).

1.9 Smallmouth Bass

Assessment gillnet and nearshore trapnet indices indicate that Smallmouth Bass remain at low to moderate abundance levels in the nearshore areas of Lake Ontario and the Bay of Quinte (Section 2.2 and Section 2.4). The Smallmouth Bass population in the Thousand Islands region has declined somewhat from recent high levels (Section 2.6).

1.10 Largemouth Bass

Assessment trapnet information indicates that Largemouth Bass abundance increased in the Bay of

Quinte following increases in water transparency and submerged aquatic vegetation in the late 1990s. Their current level of abundance exceeds that of Walleye in Bay of Quinte nearshore areas (Section 2.4). Largemouth Bass are moderately abundant in other embayment areas of Lake Ontario.

1.11 Panfish

Panfish, particularly Pumpkinseed, Bluegill and Black Crappie, increased after re-establishment of submerged aquatic macrophytes in the Bay of Quinte (Sections 2.2 and 2.3). These events were associated with post-dreissenid mussel invasion in the 1990s. Panfish are also common in other Lake Ontario embayments and nearshore areas (Section 2.4). Together, these panfish species now form a major component of the commercial fishery; second only to Yellow Perch in terms of landed value (Section 4.1).

1.12 Yellow Perch

Yellow Perch is one of the most common species in the nearshore areas. Current perch abundance in Lake Ontario proper is low to moderate compared to past levels (Section 2.2). Abundance is relatively high in the Bay of Quinte (Sections 2.2 and 2.3) and the St. Lawrence River (Section 2.6). Yellow Perch are currently the most valuable species in the commercial fishery. Yellow Perch commercial harvest has been steady or increasing in all major quota zones except quota zone 1-2 in eastern Lake Ontario where harvest levels have declined in recent years (Section 4.1).

1.13 Walleye

The eastern Lake Ontario/Bay of Quinte Walleye population is the basis of important and popular fisheries. Assessment gillnet abundance indices (Section 2.2 and 2.3) for juvenile (age-1 to age-4) and mature Walleye indicate that the Walleye population has stabilized or increased during the last decade following their steady decline throughout the 1990s. Recruitment indices, based on young of year catch in bottom trawls, indicate that a strong year-class was produced in 2003, and that above average (i.e. average for the last ten years) year-classes were produced in 2007, 2008 and in 2011. The 2009 and 2010 year-classes are of moderate abundance. The 2008 year-class also appears strong at older ages in gillnet (Section 2.2) and nearshore trap net (Section 2.4) surveys. Based on these recent recruitment levels, the Walleye population should remain stable or increase, at least through the next few years. Current Walleye status meets and exceeds management target levels for this population.

1.14 Prey Fish

The numeric abundance of yearling-and-older Alewife increased from 2009, but remains within the generally low levels observed since 2003. Their overall biomass decreased because the 2011 population was younger and smaller (Section 2.5). The population of Rainbow Smelt was not assessed in 2011.

1.15 Round Goby

Round Goby invaded Lake Ontario in the late 1990s and first appeared in routine Bay of Quinte assessment bottom trawls in 2001 and gillnets in 2002. Goby distribution expanded to include all areas of eastern Lake Ontario and the Bay of Quinte to depths of at least 36 m by 2006. Goby abundance appears to have peaked and declined in the Bay of Quinte. In Lake Ontario, abundance has remained high (see Sections 2.2 and 2.3).

2. Index Fishing Projects

2.1 Ganaraska Fishway Rainbow Trout Assessment

The number of Rainbow Trout migrating into the Ganaraska River to spawn has been estimated in the fishway at Port Hope since 1974. Prior to 1987 counts of Rainbow Trout at the fishway were based completely on hand lift and visual counts. Since 1987 fish counts were made with a Pulsar Model 550 conductivity type fish counter. Estimates of fish missed by the counter were made using simultaneous visual counts. Usually, this counter has been installed during mid to late March until early May during the spring Rainbow Trout spawning run. In 2011, the fish counter was installed on March 31. Estimates of the number in March, prior to installation of the counter were made by modelling the relationship of Rainbow Trout counts with maximum air temperature and stream flow. Two warm periods in March suggested a significant number of Rainbow Trout may have entered the fishway prior to installation of the counter. After a stable period from 1998-2009, the estimated number of Rainbow Trout in the spring run doubled over the past two years (Fig. 2.1.1), and was 9,058 fish in 2011 (Table 2.1.1).

Rainbow Trout were measured, weighed, and examined for lamprey marks during the spawning run. Rainbow Trout body condition was determined as the estimated weight of a 635 mm (25 in) fish at the Ganaraska River. In 2011, the condition of male (3,008 g) and female (3,124 g) Rainbow Trout were not significantly different ($P>0.05$) than in 2010, and were close to the long-term average since 1974 (Table 2.1.2).

In 2011, lamprey marks on Rainbow Trout in the Ganaraska River declined by 62% to 0.528 marks/ fish, continuing the trend over four successive years (Table 2.1.3). The marking rate is still higher than any value during 1990-2003 (Fig. 2.1.2). Marking rates from 2004-2011 are similar to levels in the 1970s (Fig. 2.1.2). A high incidence of A1 and B1 (freshest) marks[1] has continued since 2004 suggesting lamprey attacks occur close to the time Rainbow Trout begin migrating into the Ganaraska River (Table 2.1.4).

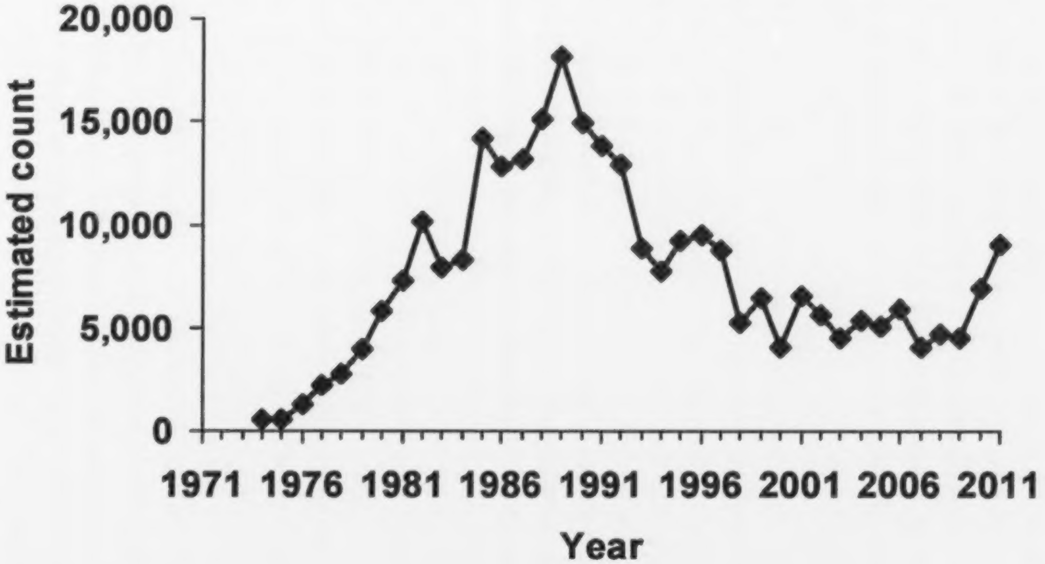

FIG. 2.1.1. Estimated upstream counts of Rainbow Trout at the Ganaraska River fishway at Port Hope, Ontario during spring, 1974-2011.

---

[1] - King, Everett Louis, Jr. and Thomas A. Edsall. 1979. Illustrated field guide for the classification of sea lamprey attack marks on great lakes Lake Trout. GLFC Special Publication 79-1.

TABLE 2.1.1. Observed and estimated number of Rainbow Trout moving upstream at the Ganaraska River fishway at Port Hope, Ontario during spring, 1974-2011. Observed numbers are the sum of hand lifted fish and visual or electronic counts. As electronic counts are biased low, estimated counts were scaled based on the difference between simultaneous visual and electronic counts. In years where no observations were made the number was estimated with virtual population analysis.

Year	Observed number	Estimated number
1974	527	527
1975	591	591
1976	1,281	1,281
1977	2,237	2,237
1978	2,724	2,724
1979	4,004	4,004
1980		5,817
1981	7,306	7,306
1982		10,127
1983	7,907	7,907
1984		8,277
1985	14,188	14,188
1986		12,785
1987	10,603	13,144
1988	10,983	15,154
1989	13,121	18,169
1990	10,184	14,888
1991	9,366	13,804
1992		12,905
1993	7,233	8,860
1994	6,249	7,749
1995	7,859	9,262
1996	8,084	9,454
1997	7,696	8,768
1998	3,808	5,288
1999	5,706	6,442
2000	3,382	4,050
2001	5,365	6,527
2002		5,652
2003	3,897	4,494
2004	4,452	5,308
2005	4,417	5,055
2006	5,171	5,877
2007	3,641	4,057
2008	3,963	4,713
2009	3,290	4,502
2010	4,705	6,923
2011	6,313	9,058

TABLE 2.1.2. Body condition (estimated weight at 635 mm) of Rainbow Trout at the Ganaraska River fishway at Port Hope, Ontario during spring, 1974-2011.

	Male		Female	
Year	Weight (g)	Sample size	Weight (g)	Sample size
1974	3,069	173	3,214	231
1975	2,971	183	3,070	279
1976	3,171	411	3,326	588
1977	2,978	635	3,166	979
1978	3,183	255	3,341	512
1979	3,221	344	3,337	626
1981	3,176	252	3,360	468
1983	2,879	308	3,032	132
1984			3,178	120
1985	3,171	410	3,205	154
1987	2,643	66	3,046	74
1990	2,868	259	3,071	197
1991	2,851	126	3,087	289
1992	2,998	138	3,113	165
1993	2,952	84	3,135	166
1994	3,247	109	3,357	178
1995	2,960	146	3,077	154
1997	3,143	140	3,269	127
1998	3,035	96	3,195	222
1999	3,063	173	3,226	290
2000	3,120	121	3,241	226
2001	2,919	295	3,040	290
2003	3,034	92	3,151	144
2004	3,054	143	3,184	248
2005	2,985	142	3,109	173
2006	3,024	101	3,137	217
2007	2,922	75	3,006	132
2008	2,889	125	3,012	148
2009	2,905	74	3,017	209
2010	3,072	72	3,139	156
2011	3,008	91	3,124	203
Average	3,016		3,161	

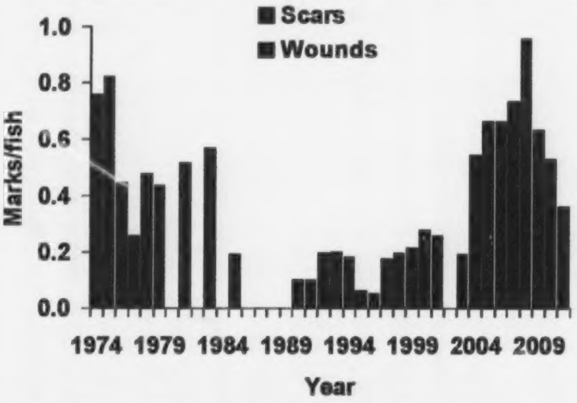

FIG. 2.1.2. Lamprey marks on Rainbow Trout in spring, 1974-2011, at the Ganaraska River fishway, in Port Hope, Ontario. Since 1990, A1 and A2 marks[1] were called wounds and the remainder of marks were called scars to fit with historical classification.

TABLE 2.1.3. Lamprey marks on Rainbow Trout in spring, 1974-2011, at the Ganaraska River fishway, in Port Hope, Ontario. Since 1990, A1 and A2 marks[1] were called wounds and the remainder of marks was called scars to fit with historical classification.

Year	Wounds/fish	Scars/fish	Marks/fish	% with wounds	% with scars	% with marks	N
1974	0.083	0.676	0.759	7.0	33.2	36.8	527
1975	0.095	0.725	0.820	8.0	37.2	40.2	599
1976	0.090	0.355	0.445	6.6	23.3	28.1	1280
1977	0.076	0.178	0.254	6.4	13.5	18.2	2242
1978	0.097	0.380	0.476	8.1	28.4	33.7	2722
1979	0.122	0.312	0.434	10.3	22.8	29.8	3926
1981			0.516			36.2	5489
1983	0.113	0.456	0.569	9.7	33.4	38.8	833
1985	0.040	0.154	0.193	3.7	11.5	14.5	1256
1990	0.015	0.087	0.102	0.0	0.1	0.1	470
1991	0.012	0.091	0.103	1.2	7.4	8.4	419
1992	0.035	0.162	0.197	2.9	14.3	16.5	315
1993	0.034	0.165	0.199	3.1	15.3	17.2	261
1994	0.027	0.156	0.183	0.0	0.1	0.2	301
1995	0.017	0.046	0.063	1.7	4.3	5.9	303
1996	0.023	0.030	0.053	2.3	3.0	5.3	397
1997	0.017	0.158	0.175	1.7	12.7	13.7	291
1998	0.035	0.162	0.197	0.0	0.1	0.2	340
1999	0.015	0.199	0.214	0.0	0.2	0.2	477
2000	0.005	0.272	0.278	0.5	23.2	23.5	371
2001	0.028	0.229	0.257	2.5	17.8	18.8	608
2003	0.017	0.176	0.193	1.7	14.3	15.1	238
2004	0.079	0.464	0.543	6.9	33.7	37.5	392
2005	0.084	0.579	0.664	6.9	39.6	41.4	321
2006	0.088	0.577	0.665	6.9	40.1	44.5	319
2007	0.068	0.665	0.733	5.3	46.6	49.0	206
2008	0.113	0.843	0.956	8.8	48.5	51.5	274
2009	0.142	0.491	0.633	12.5	36.3	42.2	289
2010	0.048	0.481	0.528	3.0	36.4	38.1	231
2011	0.070	0.292	0.362	6.0	25.8	29.9	298

TABLE 2.1.4. Classification of lamprey marks[1] on Rainbow Trout in spring, 1990-2011, at the Ganaraska River fishway, in Port Hope, Ontario.

	Marks/fish							
Year	A1	A2	A3	A4	B1	B2	B3	B4
1990	0	0.015	0.009	0.009	0	0.002	0.017	0.051
1991	0	0.012	0.012	0.002	0.029	0.01	0.019	0.019
1992	0.013	0.022	0.025	0.019	0.079	0.006	0.01	0.022
1993	0.011	0.023	0.019	0.023	0.061	0	0.008	0.054
1994	0.007	0.02	0.01	0.007	0.076	0.01	0.01	0.043
1995	0.007	0.01	0.017	0.003	0	0	0.02	0.007
1996	0.013	0.01	0.003	0.003	0.005	0.013	0	0.008
1997	0.003	0.014	0.021	0	0	0.021	0.017	0.1
1998	0.012	0.024	0.012	0.041	0.012	0.003	0.015	0.079
1999	0	0.013	0.023	0.021	0.01	0.023	0.019	0.105
2000	0	0.005	0.027	0.057	0	0.003	0.003	0.183
2001	0.002	0.026	0.021	0.069	0	0	0.002	0.137
2003	0	0.013	0.021	0.029	0	0.008	0.004	0.118
2004	0.02	0.059	0.084	0.064	0.186	0.005	0.031	0.094
2005	0.016	0.069	0.075	0.072	0.315	0.003	0.04	0.075
2006	0.028	0.06	0.147	0.05	0.15	0.031	0.047	0.15
2007	0.01	0.058	0.087	0.044	0.432	0	0.034	0.068
2008	0.022	0.091	0.142	0.018	0.38	0.015	0.161	0.128
2009	0.087	0.055	0.073	0.042	0.225	0.01	0.017	0.125
2010	0.026	0.022	0.061	0.026	0.242	0.004	0.039	0.104
2011	0.04	0.03	0.027	0.027	0.158	0	0.02	0.05

2.2 Eastern Lake Ontario and Bay of Quinte Fish Community Index Gillnetting

This gillnetting program is used to monitor the abundance of a variety of warm, cool and cold-water fish species in the eastern Lake Ontario and Bay of Quinte. Data from the program are used to help manage local commercial and recreational fisheries as well as for detecting long-term change in the Lake Ontario ecosystem.

Gillnetting areas are shown in Fig. 2.2.1 and the basic sampling design is summarized in Table 2.2.1. Included in the design are fixed, single-depth sites and depth-stratified sampling areas. Each site or area is visited two or three times within a specified time-frame and using 2, 3 or 8 replicate gillnet gangs.

Annual index gillnetting field work occurs during summer months. Summer was chosen based on an understanding of water temperature stability, fish movement/migration patterns, fish growth patterns, and logistical considerations. The time-frames for completion of field work varies among sampling sites/areas (See Table 2.2.1) because the probability of encountering a wide range of water temperatures across the depth ranges sampled varies both seasonally and by geographic area.

Monofilament gillnets with standardized specifications are used (monofilament mesh replaced multifilament in 1992; only catches from 1992-present are tabulated below). Each gillnet gang consists of a graded series of ten monofilament gillnet panels of mesh sizes from 38 mm (1 ½ in) to 152 mm (6 in) stretched mesh at 13 mm (½ in) intervals, arranged in sequence. However, a standard gillnet gang may consist of one of two possible configurations. Either, each of the ten mesh sizes (panels) is 15.2 m (50 ft) in length (total gang length is 152.4 m (500 ft)), or, the 38 mm (1 ½ in) mesh size (panel) is 4.6 m (15 ft) in length and the remaining mesh sizes are 15.2 m (50 ft) each in length (total gang length is

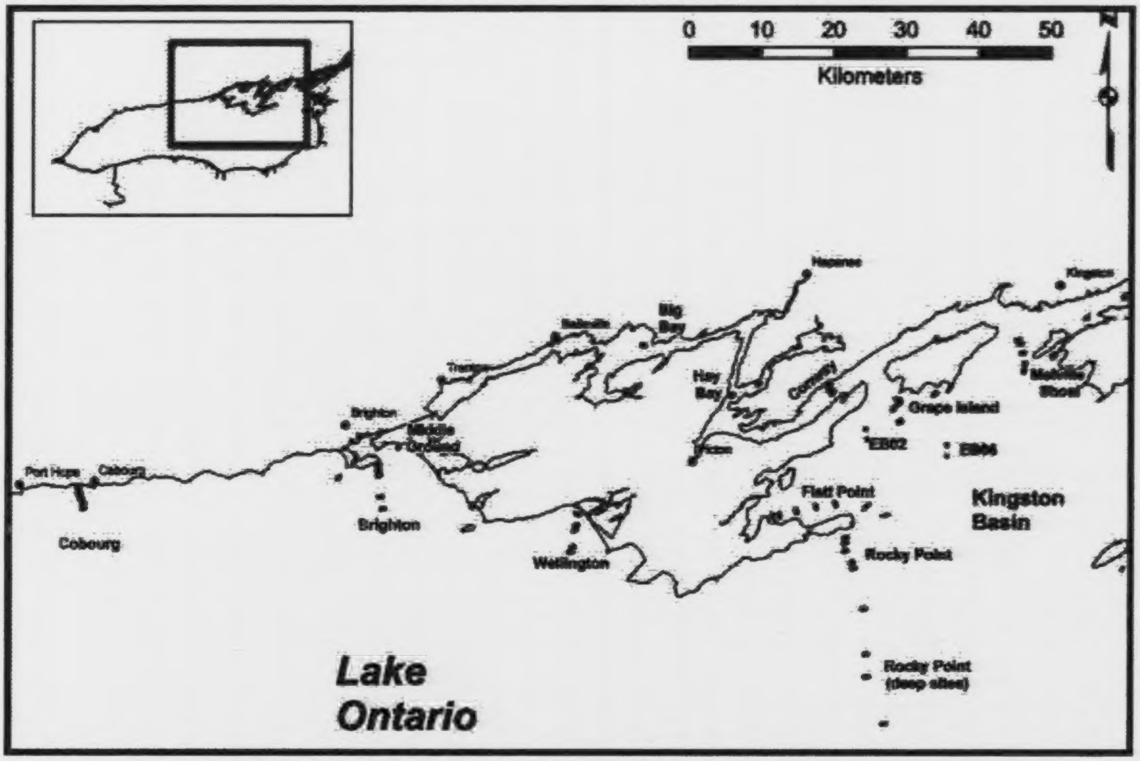
0
10
20
30
40
50
Kilometers
N
Napanee
Kingston
Big Bay
Belleville
Trenton
Hay Bay
Conway
Melville Shoal
Brighton
Middle Ground
Grape Island
EB02
EB06
Picton
Port Hope
Cobourg
Flatt Point
Kingston Basin
Brighton
Cobourg
Rocky Point
Wellington
Lake Ontario
Rocky Point (deep sites)

FIG. 2.2.1. Map of north eastern Lake Ontario. Shown are eastern Lake Ontario and Bay of Quinte fish community index gill netting sites.

TABLE. 2.2.1. Sampling design (2011) of the eastern Lake Ontario and Bay of Quinte fish community index gillnetting program including geographic and depth stratification, number of visits, number of replicate gillnet gangs set during each visit, and the time-frame for completion of visits.

						Replicates[3]		Site location (approx)					
Region name	Area Name (Area code)	Design	Site name	Depth (m)	Visits	465 feet	500 feet	Latitude (dec min)	Longitude (dec min)	Visits x Replicates	Time-frame	Start-up year	Number years[4]
Northeastern Lake Ontario	Cobourg (CB)	Depth stratified area	CB08	7.5	2	2		435701	781167	4		2010	2
Northeastern Lake Ontario	Cobourg	Depth stratified area	CB13	12.5		2		435661	781157	4			
Northeastern Lake Ontario	Cobourg	Depth stratified area	CB18	17.5		2		435622	781136	4			
Northeastern Lake Ontario	Cobourg	Depth stratified area	CB23	22.5		2		435584	781109	4			
Northeastern Lake Ontario	Cobourg	Depth stratified area	CB28	27.5		2		435549	781110	4			
Northeastern Lake Ontario	Middle Ground (MG)	Fixed site	MG05	5	2	2		440054	773906	4	Aug 1-Sep 15	1979	33
Northeastern Lake Ontario	Brighton (BR)	Depth stratified area	BR08	7.5	2	2		435955	774058	4	Aug 1-Sep 15	1988	24
Northeastern Lake Ontario	Brighton	Depth stratified area	BR13	12.5		2		435911	774071	4			
Northeastern Lake Ontario	Brighton	Depth stratified area	BR18	17.5		2		435878	774053	4			
Northeastern Lake Ontario	Brighton	Depth stratified area	BR23	22.5		2		435777	774034	4			
Northeastern Lake Ontario	Brighton	Depth stratified area	BR28	27.5		2		435624	774004	4			
Northeastern Lake Ontario	Wellington (WE)	Depth stratified area	WE08	7.5	2	2		435622	772011	4	Aug 1-Sep 15	1988	24
Northeastern Lake Ontario	Wellington	Depth stratified area	WE13	12.5		2		435544	772027	4			
Northeastern Lake Ontario	Wellington	Depth stratified area	WE18	17.5		2		435515	772025	4			
Northeastern Lake Ontario	Wellington	Depth stratified area	WE23	22.5		2		435378	772050	4			
Northeastern Lake Ontario	Wellington	Depth stratified area	WE28	27.5		2		435348	772066	4			
Northeastern Lake Ontario	Rocky Point (RP)	Depth stratified area	RP08	7.5	2	2		435510	765220	4	Jul 21-Sep 15	1988	24
Northeastern Lake Ontario	Rocky Point	Depth stratified area	RP13	12.5		2		435460	765230	4			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	RP18	17.5		2		435415	765222	4			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	RP23	22.5		2		435328	765150	4			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	RP28	27.5		2		435285	765135	4			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	0060	60	2		3	434950	765029	6	Jul 1-Jul 31	1997	15
Northeastern Lake Ontario	Rocky Point	Depth stratified area	0080	80			3	434633	765006	6			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	0100	100			3	434477	764998	6			
Northeastern Lake Ontario	Rocky Point	Depth stratified area	0140	140			3	434122	764808	6			
Kinston Basin (nearshore)	Flatt Point (FP)	Depth stratified area	FP08	7.5	2	2		435665	765993	4	Jul 1-Jul 31	1986	26
Kinston Basin (nearshore)	Flatt Point	Depth stratified area	FP13	12.5		2		435659	765927	4			
Kinston Basin (nearshore)	Flatt Point	Depth stratified area	FP18	17.5		2		435688	765751	4			
Kinston Basin (nearshore)	Flatt Point	Depth stratified area	FP23	22.5		2		435726	765541	4			
Kinston Basin (nearshore)	Flatt Point	Depth stratified area	FP28	27.5		2		435754	765314	4			
Kinston Basin (nearshore)	Grape Island (GI)	Depth stratified area	GI08	7.5	2	2		440537	764712	4	Jul 1-Jul 31	1986	26
Kinston Basin (nearshore)	Grape Island	Depth stratified area	GI13	12.5		2		440523	764747	4			
Kinston Basin (nearshore)	Grape Island	Depth stratified area	GI18	17.5		2		440476	764710	4			
Kinston Basin (nearshore)	Grape Island	Depth stratified area	GI23	22.5		2		440405	764718	4			
Kinston Basin (nearshore)	Grape Island	Depth stratified area	GI28	27.5		2		440470	764796	4			
Kinston Basin (nearshore)	Melville Shoal (MS)	Depth stratified area	MS08	7.5	2	2		441030	763500	4	Jul 1-Jul 31	1986	26
Kinston Basin (nearshore)	Melville Shoal	Depth stratified area	MS13	12.5		2		441004	763470	4			
Kinston Basin (nearshore)	Melville Shoal	Depth stratified area	MS18	17.5		2		440940	763460	4			
Kinston Basin (nearshore)	Melville Shoal	Depth stratified area	MS23	22.5		2		440835	763424	4			
Kinston Basin (nearshore)	Melville Shoal	Depth stratified area	MS28	27.5		2		440792	763424	4			
Kinston Basin (offshore)	Eastern Basin (EB)	Fixed site	EB02	30	3		8	440330	765050	24	Last week Jun-Sep 15	1968	44
Kinston Basin (offshore)	Eastern Basin (EB)	Fixed site	EB06	30	3		8	440220	764210	24	Last week Jun-Sep 15	1968	44
Bay of Quinte	Conway (CO)[1]	Depth stratified area	CO08	7.5	2		2	440664	765463	4	Jul 21-Aug 21	1972	40
Bay of Quinte	Conway	Depth stratified area	CO13	12.5			2	440649	765452	4			
Bay of Quinte	Conway	Depth stratified area	CO20	20			2	440643	765453	4			
Bay of Quinte	Conway	Depth stratified area	CO30	30			2	440707	765458	4			
Bay of Quinte	Conway	Depth stratified area	CO45	45			2	440601	765402	4			
Bay of Quinte	Hay Bay (HB)[2]	Depth stratified area	HB08	7.5	2		2	440656	770156	4	Jul 21-Aug 21	1959	53
Bay of Quinte	Hay Bay	Depth stratified area	HB13	12.5			2	440575	770400	4			
Bay of Quinte	Big Bay (BB)	Fixed site	BB05	5	3		2	440920	771360	6	Jul 21-Aug 21	1972	40

Notes:

[1] changed from a fixed site where the gillnet gang was set perpendicular to shore across depth contours to a depth stratified area with five depths (sites) in 1992.

[2] changed from a fixed site where the gillnet was set parallel and close to shore to a depth stratified area with two depths (sites) in 1992.

[3] two types of gillnet effort or gangs are used; both types consist of a graded series of mesh sizes attached in series by size from 38-152 mm at 13 mm intervals; one type has 4.6 m (15 ft) of 38 mm mesh and 15.2 m (50 ft) of all nine other mesh sizes; the second type has 15.2 m (50 ft) of all ten mesh sizes.

[4] the basic sampling design of the program has been largely consistent since 1992.

141.7 m (465 ft)) (see Table 2.2.1). Note that use of the shorter 38 m gillnet panel is related to process time required to deal with large numbers of small fish (e.g., Alewife and Yellow Perch) caught in this small mesh size. Gillnet gangs are connected in series (i.e., cork lines and lead lines attached), but are separated by a 15.2 m (50 ft) spacer to minimize "leading" of fish. The 152 mm (6 in) end of one gang is connected to the 38 mm (1 ½ in) gang of the adjoining gang. The entire gillnet strap (all joined gangs) is set within 2.5 m of the site depth listed in Table 2.2.1. Gillnet set duration ranges from 18-24 hr.

Species-specific gillnet catch summaries are shown by geographic area/site in Tables 2.2.2-2.2.15. Catches were summed across the ten mesh sizes from 1½-6 inch. In the case where the

38 mm mesh size used was 4.6 m in length, the catch in this mesh was adjusted (i.e., multiplied by 15.2/4.6) prior to summing the ten mesh sizes. Therefore, all reported catches represent the total catch in a 152.4 m (500 ft) gang of gillnet.

Gillnetting occurred from 27-Jun to 30-Aug. Twenty-four different species and over thirty-five thousand individual fish were caught in 2011. About 88% of the catch was alewife.

Selected biological information is also presented below for selected species including Lake Whitefish, Walleye, Round Goby, Lake Herring and Lake Trout.

Lake Ontario

Cobourg (Table 2.2.2)

Alewife dominate the catches at Cobourg but the salmonid fish community is also well represented at this location.

Middle Ground (Table 2.2.3)

Yellow Perch are the most common species at Middle Ground and no obvious trends in abundance since 1992 are apparent.

TABLE 2.2.2. Species-specific catch per gillnet set at **Cobourg, Lake Ontario**, 2010-2011. Annual catches are averages for 2 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. The total number of species caught and gillnets set each year are indicated.

	2010	2011
Alewife	351.96	196.13
Chinook salmon	0.68	2.05
Rainbow trout	0.51	0.25
Brown trout	0.13	0.65
Lake trout	0.37	0.05
Lake whitefish	-	0.05
Round whitefish	0.07	0.05
Rainbow smelt	-	0.33
White sucker	0.10	0.37
Smallmouth bass	-	0.05
Yellow perch	0.33	-
Walleye (Yellow pickerel)	0.03	-
Round goby	2.20	9.91
Freshwater drum	-	0.05
Total catch	356	210
Number of species	10	12
Number of sets	30	20

TABLE 2.2.3. Species-specific catch per gillnet set at **Middle Ground, Lake Ontario**, 1992-2011. Annual catches are averages for 2 gillnet gangs set during each of 1-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Longnose gar	-	-	-	0.25	-	-	-	-	-	-	-	**0.03**	-
Alewife	**3.61**	0.83	0.83	-	-	-	-	-	0.83	8.26	3.30	**1.40**	190.83
Gizzard shad	**0.39**	-	-	-	-	0.50	-	0.25	-	-	0.25	**0.10**	-
Brown trout	**0.11**	-	-	-	-	-	0.25	-	0.25	0.50	0.25	**0.13**	0.25
Lake trout	**0.90**	-	-	-	-	-	0.25	-	-	-	-	**0.03**	-
Northern pike	**0.34**	-	-	0.50	-	0.25	0.25	1.50	1.00	1.25	0.25	**0.50**	1.25
White sucker	**1.40**	1.50	3.08	-	2.08	0.75	1.25	4.00	2.25	1.00	5.83	**2.17**	3.25
Common carp	**0.41**	0.50	-	0.75	0.50	-	-	-	-	-	-	**0.18**	-
Brown bullhead	**1.42**	2.00	0.50	2.15	0.25	1.58	0.83	0.75	0.25	-	-	**0.83**	0.25
White perch	**0.08**	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	**1.47**	1.08	0.25	0.50	0.75	0.50	-	1.08	-	-	0.25	**0.44**	-
Pumpkinseed	**0.18**	-	-	-	-	-	-	-	-	-	-	-	-
Bluegill	**0.06**	-	-	-	-	-	-	-	-	-	-	-	0.25
Smallmouth bass	**0.02**	-	-	-	0.25	-	-	0.25	-	-	-	**0.05**	-
Largemouth bass	**0.06**	-	-	-	-	-	-	-	-	-	-	-	-
Yellow perch	**56.68**	43.38	60.90	25.86	68.12	29.34	105.73	29.26	44.35	22.65	13.64	**44.32**	68.09
Walleye (Yellow pickerel)	**2.44**	0.25	0.50	1.00	0.50	0.75	1.25	3.50	0.75	0.75	0.25	**0.95**	0.25
Freshwater drum	**0.57**	-	0.25	-	3.00	0.25	-	0.50	-	0.50	-	**0.45**	-
Total catch	**70**	50	66	31	75	34	110	41	50	35	24	**52**	264
Number of species	**8**	7	7	7	8	8	7	9	7	7	8	**8**	8
Number of sets		4	4	4	4	4	4	4	4	4	4		4

North East (Brighton, Wellington and Rocky Point) and Kingston Basin (Melville Shoal, Grape Island and Flatt Point) Nearshore Areas (Tables 2.2.4-2.2.9 inclusive)

Six depth-stratified sampling areas (Melville Shoal, Grape Island, Flat Point, Rocky Point, Wellington and Brighton) that employ a common and balanced sampling design are used here to provided a broad picture of the warm, cool and coldwater fish community inhabiting open-coastal waters out to about 30 m water depth. Results were summarized and presented graphically (Fig. 2.2.2) to illustrate abundance trends of the most abundant nearshore (Yellow Perch, Round Goby, Walleye, Rock Bass and Smallmouth Bass), offshore benthic (Lake Trout, Lake Whitefish, Round Whitefish and Burbot), and offshore pelagic (Alewife, Chinook Salmon, Brown Trout and Cisco) fish species.

Most species showed peak abundance levels in the early 1990s followed by dramatic abundance decline. Recent abundance trends varied among species in the nearshore zone but all species remain at moderate abundance levels. Offshore benthic species all remained at extremely low abundance levels. Offshore pelagic species all tended to show increasing abundance levels very recently. Alewife, the most common species caught, have increased in abundance over the last few years.

Rocky Point—Deep Sites (Table 2.2.10)

Seven species have been captured at the Rocky Point deep sampling sites since 1997. Alewife and Lake Trout are the two most abundant species. Higher Alewife abundance has been observed since 2008. Lake Trout abundance was relatively stable from 1997-2002, declined significantly through 2004 and remained steady in the following years.

TABLE 2.2.4. Species-specific catch per gillnet set at **Brighton in North eastern Lake Ontario**, 1992-2011. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Alewife	**34.82**	49.58	107.40	31.81	22.39	41.27	72.52	3.52	89.17	209.81	67.05	**69.45**	307.74
Gizzard shad	**0.44**	-	-	-	-	-	-	-	-	-	0.15	**0.02**	-
Coho salmon	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-
Chinook salmon	**0.74**	0.10	0.35	1.25	0.45	0.42	0.20	0.62	0.30	0.05	0.71	**0.44**	0.83
Brown trout	**0.12**	-	-	0.35	0.20	0.05	0.15	0.10	0.30	0.15	1.25	**0.26**	0.60
Lake trout	**5.22**	1.30	1.05	0.40	0.95	0.15	0.30	0.05	-	0.05	0.10	**0.44**	0.15
Lake whitefish	**0.42**	0.05	-	0.05	-	-	-	-	-	-	-	**0.01**	-
Cisco (Lake herring)	**0.12**	-	-	0.05	-	0.10	0.10	0.05	0.25	0.05	-	**0.06**	0.05
Round whitefish	**1.19**	-	0.25	0.05	0.05	-	-	-	-	-	-	**0.04**	-
Rainbow smelt	**0.11**	-	-	-	-	-	-	-	-	-	0.10	**0.01**	0.22
Northern pike	**0.08**	-	-	0.05	-	0.10	-	0.20	0.05	0.05	-	**0.05**	0.05
White sucker	**0.41**	-	0.10	-	0.05	0.15	0.05	0.10	-	-	0.05	**0.05**	0.05
Lake chub	-	-	-	-	-	-	-	-	0.17	-	-	**0.02**	-
Common carp	**0.12**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-
Brown bullhead	**0.10**	0.52	0.20	0.85	0.27	0.35	-	0.25	0.22	0.05	-	**0.27**	-
Channel catfish	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
American eel	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	**0.05**	0.05	-	-	-	-	0.05	0.05	-	-	-	**0.02**	-
White perch	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	**0.88**	-	0.32	0.63	0.76	0.32	0.15	0.32	0.80	0.33	0.33	**0.39**	-
Pumpkinseed	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Smallmouth bass	**0.00**	-	-	-	-	-	-	-	-	-	0.05	**0.01**	-
Yellow perch	**15.64**	-	0.50	0.50	0.33	1.16	2.99	1.57	4.83	0.17	0.17	**1.22**	-
Walleye (Yellow pickerel)	**0.44**	-	0.15	0.25	0.50	0.20	0.05	0.75	0.10	-	0.10	**0.21**	-
Round goby	-	-	-	0.17	0.17	4.45	1.98	0.63	1.70	1.32	0.99	**1.14**	1.21
Freshwater drum	**0.17**	-	-	0.15	0.10	-	0.05	0.05	-	-	-	**0.04**	-
Total catch	61	52	110	37	26	49	79	8	98	212	71	74	311
Number of species	13	6	9	15	12	12	12	14	11	10	12	11	9
Number of sets		20	20	20	20	20	20	20	20	20	20		20

TABLE 2.2.5. Species-specific catch per gillnet set at **Wellington in North eastern Lake Ontario, 1992-2011**. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Alewife	**17.25**	20.85	50.58	62.26	38.23	83.22	137.33	1.54	79.05	447.66	215.85	**113.66**	475.42
Gizzard shad	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-
Chinook salmon	**0.33**	0.10	0.20	0.35	1.20	0.10	0.20	0.35	0.45	-	0.10	**0.31**	0.65
Rainbow trout	-	-	-	-	-	-	-	-	-	-	0.05	**0.01**	-
Brown trout	**0.11**	0.15	0.30	0.15	0.40	0.15	-	0.10	0.40	0.45	1.55	**0.37**	0.60
Lake trout	**7.58**	2.40	2.20	0.85	1.85	0.45	0.70	0.40	0.05	0.25	0.10	**0.93**	0.25
Lake whitefish	**0.61**	0.10	0.05	-	-	-	-	-	-	-	-	**0.02**	0.35
Cisco (Lake herring)	**0.11**	-	-	-	-	-	0.05	-	-	0.05	0.05	**0.02**	0.05
Round whitefish	**0.06**	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow smelt	**0.07**	-	-	-	-	-	-	-	0.05	0.10	0.17	**0.03**	0.05
Northern pike	**0.01**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	0.05
White sucker	**0.05**	-	-	-	0.17	-	-	0.05	-	-	-	**0.02**	-
Greater redhorse	-	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-
Lake chub	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	**0.02**	-	-	-	-	0.05	-	-	-	-	-	**0.01**	-
Brown bullhead	**0.00**	0.05	0.10	-	0.05	0.15	-	-	-	-	-	**0.04**	-
Burbot	**0.23**	0.10	0.25	0.05	0.05	-	0.10	-	0.05	-	0.05	**0.07**	-
White perch	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	**0.35**	0.17	-	0.52	0.10	0.05	-	-	0.58	-	-	**0.14**	-
Smallmouth bass	**0.03**	-	-	-	-	-	-	-	-	-	-	-	0.05
Yellow perch	**31.00**	12.67	6.22	17.96	10.31	14.51	7.25	23.48	17.65	25.87	14.11	**15.00**	2.47
Walleye (Yellow pickerel)	**0.36**	-	0.10	0.20	0.25	0.20	0.10	0.10	-	-	0.05	**0.10**	0.05
Round goby	-	-	-	0.33	0.99	25.92	18.39	2.03	11.50	1.16	6.94	**6.73**	3.35
Freshwater drum	**0.25**	-	0.05	-	0.05	0.05	-	-	-	-	-	**0.02**	-
Total catch	**58**	37	60	83	54	125	164	28	110	476	239	**137**	483
Number of species	**11**	9	10	11	12	11	8	8	9	7	11	**10**	12
Number of sets		20	20	20	20	20	20	20	20	20	20		20

TABLE 2.2.6. Species-specific catch per gillnet set at **Rocky Point (nearshore sites only) in North eastern Lake Ontario**, 1992-2011. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Alewife	**131.93**	105.42	141.61	86.90	155.51	293.30	142.82	135.36	231.74	176.68	662.38	**213.17**	530.40
Chinook salmon	**0.23**	-	0.10	0.25	0.55	0.15	0.27	0.10	0.15	-	0.70	**0.23**	0.20
Rainbow trout	-	-	-	-	-	-	0.05	-	-	-	-	**0.01**	-
Atlantic salmon	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-
Brown trout	**0.09**	-	1.20	0.05	0.25	0.25	0.45	0.10	0.50	-	0.80	**0.36**	1.55
Lake trout	**5.40**	1.67	0.80	0.10	0.60	-	0.47	0.05	0.25	0.05	0.32	**0.43**	1.35
Lake whitefish	**0.69**	0.05	-	0.30	0.10	0.05	0.10	0.05	0.25	0.45	-	**0.14**	0.10
Cisco (Lake herring)	**0.07**	-	-	-	-	-	-	-	-	-	-	-	0.05
Chub	-	0.17	-	-	-	-	-	-	-	-	-	**0.02**	-
Rainbow smelt	**0.03**	-	-	-	-	-	-	-	0.17	-	-	**0.02**	-
White sucker	**0.04**	0.05	-	-	-	-	-	0.05	-	-	-	**0.01**	-
Lake chub	**0.11**	-	0.17	-	-	-	-	0.05	-	-	-	**0.02**	-
Common carp	**0.01**	-	-	-	0.10	0.05	-	-	-	-	-	**0.02**	-
Brown bullhead	-	-	-	-	0.05	-	-	-	-	-	-	**0.01**	-
Channel catfish	-	-	-	-	-	-	-	-	-	0.05	-	**0.01**	-
Stonecat	**0.01**	0.70	0.17	0.05	-	0.10	0.05	0.27	-	-	-	**0.13**	-
Burbot	**0.28**	0.15	0.35	0.10	0.05	0.30	-	-	-	-	0.05	**0.10**	-
Rock bass	**0.31**	0.32	0.53	0.87	0.05	0.35	0.55	0.63	0.86	0.32	0.86	**0.53**	0.05
Smallmouth bass	**1.05**	0.70	0.65	0.67	0.80	0.42	0.42	0.52	0.55	0.15	0.50	**0.54**	0.20
Yellow perch	**0.06**	-	-	-	-	0.17	0.81	0.88	0.22	0.33	1.75	**0.42**	0.60
Walleye (Yellow pickerel)	**0.67**	-	0.25	0.10	0.80	1.60	0.65	0.85	0.65	0.15	0.45	**0.55**	0.10
Round goby	-	-	-	-	-	2.15	8.48	71.25	9.50	28.26	15.93	**13.56**	6.54
Freshwater drum	**0.19**	0.10	0.05	0.05	0.30	-	0.10	-	0.20	0.15	0.15	**0.11**	-
Total catch	**141**	109	146	89	159	299	155	210	245	207	684	**230**	541
Number of species	**10**	10	11	11	12	12	13	13	12	10	11	**12**	11
Number of sets		20	20	20	20	20	20	20	20	20	20		20

TABLE 2.2.7. Species-specific catch per gillnet set at **Flatt Point in the Kingston Basin of Lake Ontario**, 1992-2011. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Lake sturgeon	**0.01**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-
Alewife	**78.18**	45.97	5.17	6.87	101.38	141.78	203.18	140.02	297.68	305.56	620.72	**186.83**	908.17
Chinook salmon	**0.16**	-	-	-	0.35	0.05	-	0.10	-	-	0.05	**0.06**	0.05
Brown trout	**0.02**	0.10	-	-	-	-	0.10	-	0.10	0.05	0.10	**0.05**	0.55
Lake trout	**10.72**	2.47	0.75	1.25	0.98	0.88	0.30	1.22	1.03	2.07	1.00	**1.19**	1.95
Lake whitefish	**4.17**	4.60	2.72	0.85	2.80	0.55	0.20	1.30	0.75	0.15	0.25	**1.42**	0.25
Cisco (Lake herring)	**0.83**	-	-	0.10	-	0.05	-	-	-	-	-	**0.02**	-
Round whitefish	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-
Coregonus sp.	**0.00**	0.05	-	-	-	-	-	-	-	-	-	**0.01**	-
Rainbow smelt	**0.22**	-	-	-	-	-	0.05	-	0.05	-	0.10	**0.02**	-
Northern pike	**0.08**	0.10	-	-	0.05	0.15	0.05	0.05	0.37	0.15	0.10	**0.10**	0.10
White sucker	**0.98**	0.45	0.45	0.70	1.00	0.60	0.35	0.20	0.50	0.05	0.20	**0.45**	0.30
Brown bullhead	**0.05**	-	0.05	0.05	0.05	0.05	-	0.05	-	-	-	**0.03**	-
Stonecat	-	0.05	0.05	-	-	-	-	-	-	-	-	**0.01**	-
Burbot	**0.02**	0.10	-	-	-	-	-	-	-	-	-	**0.01**	-
White perch	**0.02**	-	-	0.10	-	-	-	-	-	-	-	**0.01**	-
Rock bass	**0.87**	0.53	0.05	0.05	0.22	-	0.70	0.25	0.27	0.05	-	**0.21**	0.73
Smallmouth bass	**0.06**	-	0.10	0.05	-	-	-	-	-	-	-	**0.02**	-
Yellow perch	**22.70**	5.24	5.02	8.62	41.35	29.83	51.51	20.53	6.23	5.06	12.17	**18.56**	9.58
Walleye (Yellow pickerel)	**0.10**	-	-	-	-	0.05	0.05	0.05	0.22	0.15	0.25	**0.08**	0.10
Round goby	-	-	-	-	0.99	4.96	12.26	8.18	1.70	0.50	2.81	**3.14**	1.49
Freshwater drum	**0.08**	-	-	-	-	-	-	-	-	-	-	-	0.05
Total catch	**119**	60	14	19	149	179	269	172	309	314	638	**212**	923
Number of species	**10**	11	9	11	10	11	11	11	11	10	11	**11**	12
Number of sets		20	20	20	20	20	20	20	20	20	20		20

TABLE 2.2.8. Species-specific catch per gillnet set at **Grape Island in the Kingston Basin of Lake Ontario**, 1992-2011. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Lake sturgeon	**0.01**	0.05	-	0.05	-	-	-	-	-	-	-	**0.01**	-
Alewife	**116.14**	155.14	15.03	47.83	42.83	225.83	376.62	153.49	358.67	244.82	719.98	**234.02**	1,244.67
Chinook salmon	**0.02**	-	-	-	-	0.15	-	0.10	-	-	-	**0.03**	-
Brown trout	**0.02**	-	-	-	0.05	0.05	0.10	-	-	-	0.05	**0.03**	0.25
Lake trout	**6.56**	0.30	0.57	0.45	0.10	0.15	0.15	0.57	0.05	0.40	0.20	**0.29**	0.20
Lake whitefish	**2.86**	0.20	0.20	0.15	-	0.10	0.10	0.20	0.10	0.10	0.10	**0.13**	0.10
Cisco (Lake herring)	**0.08**	-	-	-	-	-	-	-	-	-	0.15	**0.02**	0.05
Rainbow smelt	**0.03**	-	-	-	-	-	-	-	-	0.05	-	**0.01**	-
Northern pike	-	-	-	-	-	-	-	0.05	-	-	-	**0.01**	-
White sucker	**0.04**	-	-	0.05	-	-	-	0.05	0.05	-	-	**0.02**	0.10
Silver redhorse	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-
Brown bullhead	-	-	-	0.15	0.17	-	0.05	-	-	-	-	**0.04**	-
Channel catfish	**0.02**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-
Stonecat	**0.04**	-	0.17	0.43	0.33	-	-	-	-	-	-	**0.09**	-
Burbot	**0.17**	-	0.10	0.05	-	-	-	-	-	-	-	**0.02**	-
Threespine stickleback	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**0.07**	-	-	0.10	0.10	0.05	-	-	-	-	-	**0.03**	-
Rock bass	**1.43**	1.01	0.05	0.72	0.33	0.17	0.37	0.93	1.01	0.43	0.35	**0.54**	0.05
Smallmouth bass	**0.68**	0.15	0.48	0.47	0.48	0.05	0.52	0.15	0.35	0.32	0.25	**0.32**	0.50
Yellow perch	**14.36**	3.54	19.72	18.54	45.07	12.18	18.13	15.82	7.44	6.98	6.91	**15.43**	4.61
Walleye (Yellow pickerel)	**2.90**	0.50	0.10	0.80	0.37	0.20	2.55	0.50	0.95	0.15	1.05	**0.72**	0.70
Round goby	-	-	-	1.32	49.22	4.51	8.35	7.97	1.09	-	1.65	**7.41**	1.16
Freshwater drum	**0.28**	0.05	-	0.20	-	-	0.05	-	0.05	-	0.05	**0.04**	-
Total catch	**146**	161	36	71	139	243	407	180	370	253	731	**259**	1,252
Number of species	**11**	9	9	16	11	11	11	11	10	8	11	**11**	11
Number of sets		20	20	20	20	20	20	20	20	20	20		20

TABLE 2.2.9. Species-specific catch per gillnet set at **Melville Shoal in the Kingston Basin of Lake Ontario**, 1992-2011. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000											**2001-2010**	
	mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011
Lake sturgeon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Alewife	**71.63**	40.83	39.19	14.14	82.41	177.38	195.64	83.04	134.66	496.46	620.85	**188.46**	666.70
Gizzard shad	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-
Chinook salmon	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-	0.05	-	-	-	**0.01**	-
Brown trout	-	-	-	-	-	-	0.05	-	0.10	-	0.15	**0.03**	0.05
Lake trout	**3.54**	0.10	0.05	0.05	0.05	-	0.05	0.05	0.10	0.40	0.15	**0.10**	1.02
Lake whitefish	**1.59**	0.10	0.20	0.30	-	-	-	0.05	-	-	-	**0.07**	-
Cisco (Lake herring)	**0.04**	-	-	-	-	-	-	-	-	-	0.20	**0.02**	0.05
Coregonus sp.	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow smelt	**0.08**	-	-	-	-	-	-	-	0.17	-	0.05	**0.02**	-
Northern pike	**0.07**	0.10	0.10	0.05	-	-	-	-	-	0.10	0.10	**0.05**	-
White sucker	**0.03**	0.05	-	0.05	-	-	-	-	-	-	-	**0.01**	-
Greater redhorse	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Moxostoma sp.	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	**0.02**	-	-	0.05	0.10	-	-	-	0.05	-	-	**0.02**	-
Channel catfish	**0.15**	-	-	0.05	-	-	-	-	-	-	-	**0.01**	-
Stonecat	**0.03**	0.33	0.43	-	-	0.50	-	-	-	-	-	**0.13**	-
Burbot	**0.10**	-	-	-	0.05	-	-	-	-	-	-	**0.01**	-
White perch	**0.20**	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	**1.88**	1.99	0.98	1.33	2.25	1.84	1.82	1.72	3.16	0.80	1.28	**1.72**	1.20
Pumpkinseed	-	0.17	-	-	-	-	-	-	-	-	-	**0.02**	-
Smallmouth bass	**0.53**	0.42	0.25	0.40	0.27	0.15	0.20	0.57	0.70	0.25	0.60	**0.38**	0.40
Yellow perch	**28.76**	12.57	26.57	20.20	49.72	16.14	44.66	38.74	18.75	9.75	25.97	**26.31**	10.38
Walleye (Yellow pickerel)	**8.73**	4.63	3.90	3.50	5.08	4.45	5.25	7.30	4.55	7.50	12.45	**5.86**	10.10
Round goby	-	-	-	-	9.02	9.80	5.34	4.84	2.18	1.16	0.50	**3.28**	0.71
Freshwater drum	**0.09**	0.05	-	0.05	-	-	-	0.22	-	-	0.10	**0.04**	0.05
Total catch	**118**	61	72	40	149	210	253	137	164	516	662	**227**	691
Number of species	**12**	12	9	12	9	7	8	10	10	8	12	**10**	10
Number of sets		20	20	20	20	20	20	20	20	20	20		20

TABLE 2.2.10. Species-specific catch per gillnet set at **Rocky Point (deep sites only) in North eastern Lake Ontario**, 1997-2011 (no sampling in 2006, 2007 or 2010). Annual catches are averages for 2 or 3 gillnet gangs set at each of 4 depths (60, 80, 100 or 140 m) during each of 2 visits during early-summer. Mean catches for 1997-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1997-2000											**2001-2010**	
	mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011
Alewife	**4.69**	12.25	0.38	9.21	14.46	1.83	-	-	23.92	40.67	-	**14.67**	35.13
Lake trout	**5.05**	6.81	6.25	4.17	2.17	1.83	-	-	1.46	1.88	-	**3.51**	2.42
Lake whitefish	**0.50**	0.13	-	0.08	-	0.08	-	-	0.25	0.50	-	**0.15**	0.13
Cisco (Lake herring)	**0.13**	-	0.13	0.08	0.21	-	-	-	-	-	-	**0.06**	-
Rainbow smelt	**0.41**	-	0.19	-	-	-	-	-	0.08	0.08	-	**0.05**	0.08
Burbot	**0.09**	-	-	-	0.04	-	-	-	-	-	-	**0.01**	-
Slimy sculpin	**0.08**	0.06	-	0.04	0.04	-	-	-	0.08	-	-	**0.03**	-
Total catch	**11**	19	7	14	17	4	-	-	26	43	-	**18**	38
Number of species	**6**	4	4	5	5	3	-	-	5	4	-	**3**	4
Number of sets		16	16	24	24	24	-	-	24	24	-		24

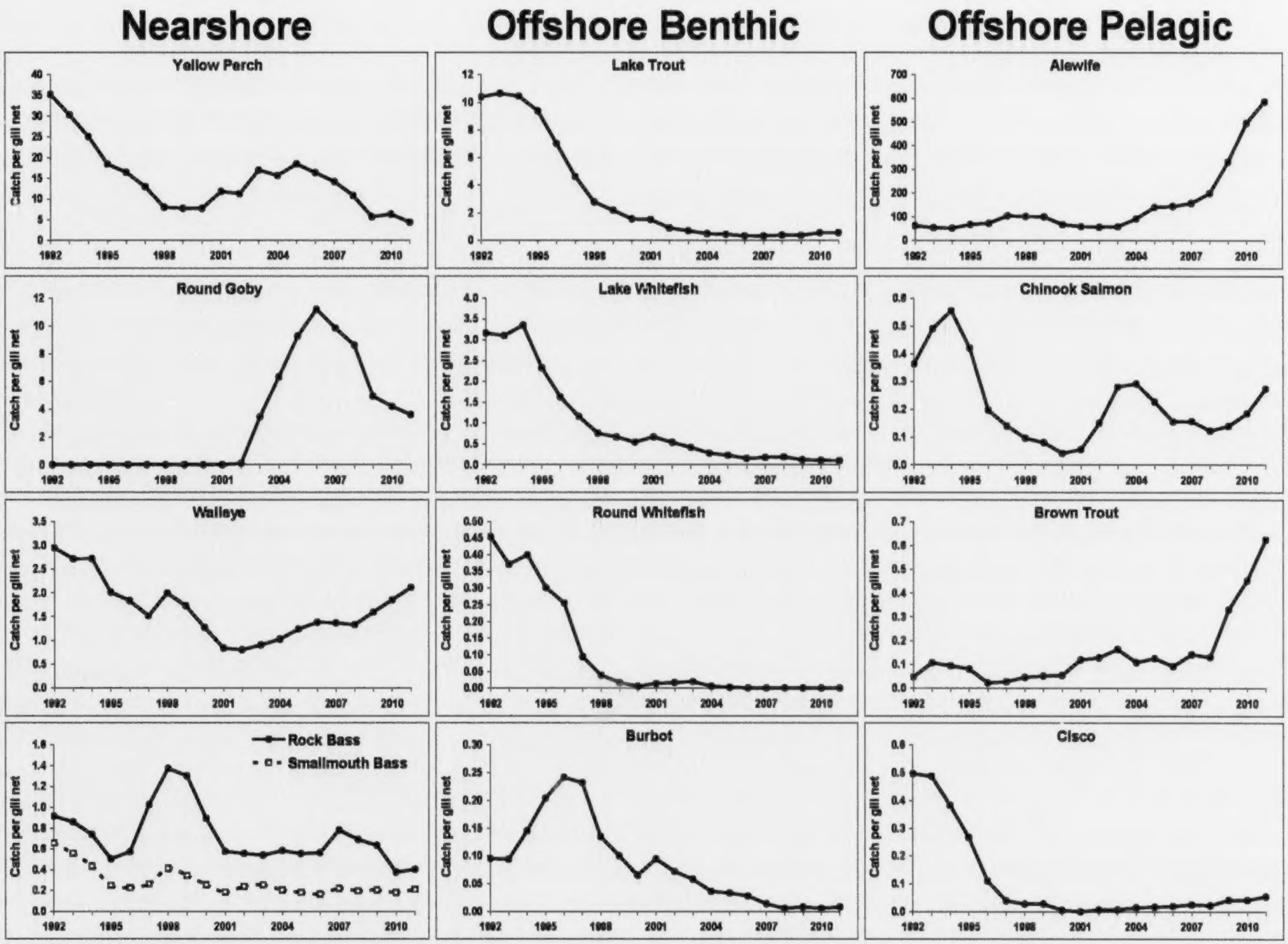

FIG. 2.2.2. Abundance trends for the most common nearshore, offshore benthic, and offshore pelagic species caught in gillnets at six depth-stratified transects (nearshore out to 30 m) in north eastern Lake Ontario (Melville Shoal, Grape Island, Flatt Point, Rocky Point, Wellington and Brighton; see Fig. 2.2.1). Annual catch per unit effort values were corrected for observed water temperature (covariate). Values shown here are 3-yr running averages (two years for first and last years graphed).

Kingston Basin—Deep Sites (EB02 and EB06; Table 2.2.11 and 2.2.12)

Two single-depth sites (EB02 and EB06) are used to monitor long-term trends in the deep water fish community the Kingston Basin. Results were summarized and presented graphically (Fig. 2.2.3) to illustrate abundance trends of the most abundant species (Alewife, Lake Trout, Lake Whitefish, Rainbow Smelt, Burbot and Round Goby). Alewife catches were variable with high catches in some years, 1998-1999 and 2010. Lake Trout, Lake Whitefish, and Rainbow Smelt abundance declined throughout the 1990s and remained low during the years that followed.

TABLE 2.2.11. Species-specific catch per gillnet set at **EB02 in the Kingston Basin of Lake Ontario**, 1992-2011. Annual catches are averages for 4-8 gillnet gangs set during each of 3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Sea lamprey	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Lake sturgeon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Alewife	**40.00**	17.83	0.25	0.25	8.67	1.75	4.50	3.25	2.92	7.46	157.00	**20.39**	2.45
Chinook salmon	**0.05**	0.25	-	0.04	0.04	-	-	0.04	-	0.13	0.08	**0.06**	-
Rainbow trout	-	-	-	-	-	-	-	-	-	-	-	-	0.04
Atlantic salmon	-	-	-	-	-	-	-	-	0.04	-	-	**0.00**	-
Brown trout	**0.02**	0.08	-	-	-	-	-	-	0.04	-	0.21	**0.03**	0.04
Lake trout	**20.57**	1.58	0.75	1.54	0.88	0.42	1.50	2.08	3.58	2.33	1.63	**1.63**	2.10
Lake whitefish	**3.76**	0.25	0.42	0.08	0.17	-	0.25	0.17	0.46	0.08	0.04	**0.19**	0.13
Cisco (Lake herring)	**0.20**	-	-	-	0.04	-	-	-	-	-	0.21	**0.03**	0.04
Rainbow smelt	**0.56**	-	-	-	0.04	0.04	0.08	0.04	-	0.17	0.17	**0.05**	-
Burbot	**0.05**	0.08	-	-	-	-	-	-	-	-	-	**0.01**	-
Trout-perch	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-	-	0.04	**0.00**	-
Smallmouth bass	-	-	-	-	-	-	-	-	-	0.04	-	**0.00**	-
Yellow perch	**0.09**	-	0.28	0.04	2.92	0.50	0.71	0.17	0.42	0.13	0.25	**0.54**	0.04
Walleye (Yellow pickerel)	**0.04**	-	-	-	0.04	-	-	-	0.04	-	-	**0.01**	-
Round goby	-	-	-	-	0.13	0.04	0.17	0.08	-	-	0.04	**0.05**	-
Freshwater drum	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin sp.	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Total catch	**65**	20	2	2	13	3	7	6	8	10	160	**23**	5
Number of species	**7**	6	4	5	9	5	6	7	7	7	10	**7**	7
Number of sets		12	12	24	24	24	24	24	24	24	24		24

TABLE 2.2.12. Species-specific catch per gillnet set at **EB06 in the Kingston Basin of Lake Ontario**, 1992-2011. Annual catches are averages for 4-8 gillnet gangs set during each of 3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Sea lamprey	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Lake sturgeon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Alewife	**28.50**	15.67	0.58	0.79	2.79	1.88	2.46	6.44	11.25	1.29	75.88	**11.90**	17.96
Chinook salmon	**0.02**	-	-	-	-	0.08	-	-	0.04	-	-	**0.01**	0.08
Rainbow trout	-	-	-	-	-	-	-	0.04	-	-	-	**0.00**	-
Brown trout	-	-	0.08	-	-	0.04	-	0.08	0.04	0.04	0.04	**0.03**	-
Lake trout	**21.88**	1.58	2.33	2.04	2.79	2.04	2.46	2.63	3.38	2.96	4.96	**2.72**	3.29
Lake whitefish	**6.36**	0.58	0.42	0.25	2.54	0.29	0.33	0.42	1.79	0.46	0.92	**0.80**	0.92
Cisco (Lake herring)	**0.03**	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow smelt	**0.52**	-	-	-	-	-	0.04	-	-	0.04	-	**0.01**	0.04
Common carp	-	-	-	-	0.04	-	-	-	-	-	-	**0.00**	-
American eel	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	**0.13**	0.17	0.08	0.04	0.04	-	-	-	-	-	-	**0.03**	-
White perch	**0.01**	-	-	0.04	-	-	-	-	-	-	-	**0.00**	-
Yellow perch	-	-	-	0.04	-	-	-	-	0.21	-	-	**0.03**	-
Walleye (Yellow pickerel)	**0.01**	-	-	-	-	-	0.04	-	-	-	-	**0.00**	0.04
Round goby	-	-	-	-	-	0.04	0.13	0.26	-	-	0.08	**0.05**	0.17
Total catch	**57**	18	4	3	8	4	5	10	17	5	82	**16**	23
Number of species	**6**	4	5	6	5	6	6	6	6	5	5	**5**	7
Number of sets		12	12	24	24	24	24	24	24	24	24		24

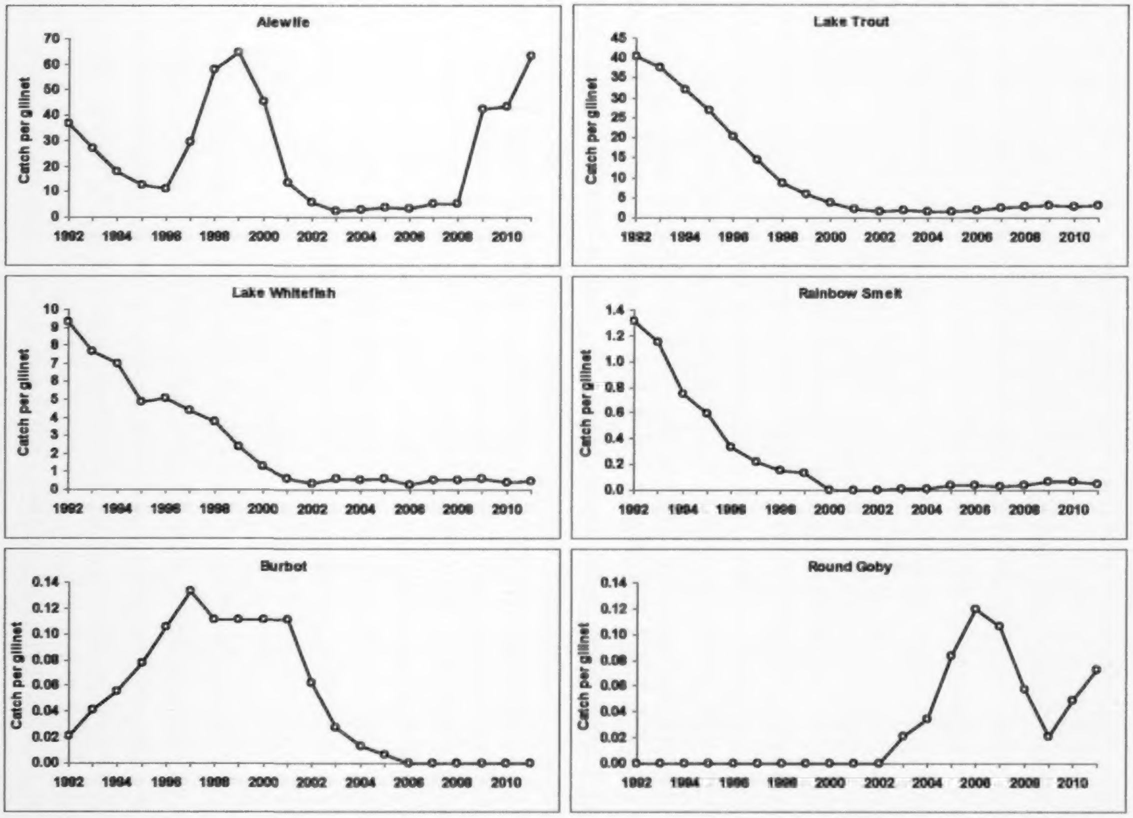

FIG. 2.2.3. Abundance trends for the most common species caught in gillnets at the Kingston Basin deep sites, in eastern Lake Ontario (EB02 and EB06; see Fig. 2.2.1). Values shown here are 3-yr running averages (two years for first and last years graphed).

Burbot catches peaked in the late-1990s then declined to zero for the last seven years.

Bay of Quinte *(Conway, Hay Bay and Big Bay; Tables 2.2.13-2.2.15 inclusive)*

Three sites are used to monitor long-term trends in the Bay of Quinte fish community. Big Bay is a single-depth site; Hay Bay has two depths and Conway five depths. Average catch for the three sites are summarized graphically in Fig. 2.2.4 to illustrate abundance trends of the most abundant species from 1992-2011. Yellow Perch abundance peaked in 1998 then gradually declined. White Perch catches were high in 1992, declined through 2001, increased to a peak in 2006 then declined. Alewife abundance has increased significantly in the last two years. Walleye abundance declined from 1992-2000 but has remained very stable since. Freshwater Drum and Gizzard Shad catches show no significant trends. White Sucker abundance has declined gradually since 1992 but with a slight increase in the last three years. Gizzard Shad catches were high in 2011. Brown Bullhead abundance has declined to precipitously low levels. Bluegill and Pumpkinseed abundance increased in the late-1990s then declined through 2004. Thereafter, Bluegill catches increased but Pumpkinseed catches did not. Cisco catches increased in the late-1990s then declined. Round Goby, a recent invader to the Bay of Quinte area, peaked in abundance in 2004 then declined.

TABLE 2.2.13. Species-specific catch per gillnet set at **Conway in the Bay of Quinte**, 1993-2011. Annual catches are averages for 2-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 2-3 visits during summer. Mean catches for 1993-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1993-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Sea lamprey	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-
Lake sturgeon	**0.00**	-	-	-	-	-	-	-	-	-	-	-	-
Longnose gar	**0.00**	0.05	-	-	-	-	-	-	-	-	-	**0.01**	-
Alewife	**46.74**	8.25	2.90	6.00	16.20	69.45	11.55	19.35	71.00	74.95	175.35	**45.50**	176.44
Gizzard shad	**0.01**	-	-	-	0.05	-	-	0.20	0.10	-	-	**0.04**	0.10
Chinook salmon	**0.03**	0.05	-	0.05	0.10	-	-	0.10	0.10	0.10	0.05	**0.06**	0.15
Rainbow trout	-	-	-	-	-	0.05	-	-	-	-	-	**0.01**	-
Atlantic salmon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Brown trout	**0.29**	0.10	0.05	0.35	0.10	0.25	0.25	0.15	0.45	0.15	0.05	**0.19**	0.40
Lake trout	**2.02**	0.75	2.30	1.75	2.05	2.75	1.15	1.35	0.95	0.10	0.15	**1.33**	0.95
Lake whitefish	**0.96**	0.45	0.25	0.75	0.10	0.60	0.30	0.25	0.20	0.05	0.20	**0.32**	0.30
Cisco (Lake herring)	**0.19**	0.20	-	-	-	-	0.05	-	0.10	0.05	0.15	**0.06**	-
Coregonus sp.	**0.00**	-	-	-	0.05	-	-	-	-	-	-	**0.01**	-
Rainbow smelt	**0.08**	0.20	-	-	0.05	0.20	0.05	-	0.35	0.10	0.15	**0.11**	0.10
Northern pike	**0.04**	0.05	-	0.05	-	-	-	0.05	0.05	-	0.05	**0.03**	-
White sucker	**2.36**	3.30	2.60	2.15	1.05	0.60	0.45	1.45	0.55	0.30	0.20	**1.27**	0.05
Silver redhorse	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Moxostoma sp.	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	**0.04**	-	-	-	-	-	-	0.05	-	-	-	**0.01**	-
Brown bullhead	**0.05**	0.05	-	0.10	0.20	0.15	0.90	0.35	-	-	-	**0.18**	0.05
Channel catfish	**0.02**	0.05	0.05	-	-	0.05	-	-	-	-	-	**0.02**	-
Stonecat	-	0.05	0.05	-	-	-	-	-	-	-	-	**0.01**	-
Burbot	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-
Trout-perch	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**1.95**	-	0.05	0.85	2.65	-	0.85	1.25	1.15	0.15	0.05	**0.70**	0.50
White bass	-	-	-	-	-	-	-	-	-	-	-	-	0.05
Rock bass	**2.19**	0.45	0.90	0.15	0.15	0.50	0.95	3.85	2.05	0.20	0.95	**1.02**	0.95
Pumpkinseed	**0.03**	0.05	0.05	0.05	-	-	-	0.05	-	-	-	**0.02**	-
Smallmouth bass	**0.31**	0.05	-	-	-	0.05	0.15	0.15	0.05	-	0.15	**0.06**	0.10
Yellow perch	**84.25**	65.50	77.50	48.65	33.15	28.00	57.25	18.20	26.10	11.60	16.25	**38.22**	25.75
Walleye (Yellow pickerel)	**8.23**	1.00	1.45	2.70	1.05	1.25	1.90	2.50	1.60	1.40	1.25	**1.61**	2.10
Round goby	-	-	1.00	11.00	31.05	0.80	0.15	0.10	0.25	-	0.05	**4.44**	-
Freshwater drum	**0.54**	0.05	0.10	0.15	0.65	0.50	1.20	1.35	0.75	0.40	0.75	**0.59**	3.25
Total catch	**150**	81	89	75	89	105	77	51	106	90	196	**96**	211
Number of species	**14**	19	14	15	16	15	15	18	17	13	16	**16**	16
Number of sets		20	20	20	20	20	20	20	20	20	20		20

TABLE 2.2.14. Species-specific catch per gillnet set at **Hay Bay in the Bay of Quinte**, 1992-2011. Annual catches are averages for 1-3 gillnet gangs set at each of 5 depths (7.5, 12.5, 17.5, 22.5 and 27.5 m) during each of 1-3 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Sea lamprey	-	-	-	-	-	-	-	-	0.13	-	-	**0.01**	-
Lake sturgeon	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Longnose gar	-	-	-	-	-	-	-	0.13	-	-	-	**0.01**	-
Alewife	**8.33**	19.25	8.13	-	1.25	0.25	7.50	3.75	0.13	9.75	28.75	**7.88**	12.00
Gizzard shad	**0.71**	-	0.25	-	-	-	0.50	0.13	0.13	-	-	**0.10**	-
Chinook salmon	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-
Brown trout	**0.01**	-	-	-	-	-	-	-	-	-	-	-	-
Lake trout	**0.12**	-	-	0.25	-	-	-	-	-	-	-	**0.03**	-
Lake whitefish	**0.06**	0.13	-	-	-	-	-	-	-	-	-	**0.01**	-
Cisco (Lake herring)	**3.79**	1.00	0.13	-	0.13	-	-	0.13	-	0.13	10.25	**1.18**	0.38
Round whitefish	-	-	-	-	-	-	-	-	0.13	-	-	**0.01**	-
Coregonus sp.	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow smelt	**0.19**	-	0.25	-	-	-	0.13	-	-	0.38	-	**0.08**	-
Northern pike	**1.00**	0.88	0.13	0.38	-	0.50	0.38	1.13	1.00	0.50	3.00	**0.79**	0.38
White sucker	**6.12**	5.63	2.88	2.25	6.13	1.50	1.75	1.38	2.50	4.25	8.75	**3.70**	2.25
River redhorse	-	-	-	-	-	-	-	0.13	-	-	-	**0.01**	-
Common carp	**0.23**	-	-	-	-	-	-	-	-	-	-	-	-
Spottail shiner	**0.01**	-	-	-	-	-	-	0.13	-	-	-	**0.01**	-
Brown bullhead	**0.94**	0.88	0.13	0.25	0.25	0.38	0.88	0.38	0.50	-	-	**0.36**	-
Channel catfish	**0.01**	-	-	0.13	0.13	-	-	-	-	-	-	**0.03**	-
Burbot	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**11.00**	0.50	5.38	8.38	14.50	0.13	30.13	16.25	20.75	9.38	1.75	**10.71**	4.00
Rock bass	**0.03**	-	-	-	-	-	-	-	0.13	-	-	**0.01**	-
Pumpkinseed	**0.86**	1.13	1.00	0.63	2.13	0.38	0.63	0.75	0.75	0.75	0.75	**0.89**	0.75
Bluegill	-	-	-	-	-	-	-	-	-	-	-	-	0.13
Smallmouth bass	**0.10**	0.13	0.13	-	-	-	-	-	-	-	-	**0.03**	-
Yellow perch	**154.09**	144.13	112.13	110.50	86.00	142.75	64.00	102.00	98.88	81.63	210.00	**115.20**	94.63
Walleye (Yellow pickerel)	**4.39**	2.50	3.75	2.75	2.13	0.88	1.75	2.50	1.13	2.75	2.00	**2.21**	1.50
Round goby	-	-	0.25	0.25	0.25	0.13	-	-	-	-	-	**0.09**	-
Freshwater drum	**1.08**	0.25	3.13	1.25	6.63	2.50	8.25	1.00	0.88	1.00	0.75	**2.56**	0.25
Total catch	**193**	176	138	127	120	149	116	130	127	111	266	**146**	116
Number of species	**14**	12	14	11	11	10	11	14	13	10	9	**12**	10
Number of sets		8	8	8	8	8	8	8	8	8	4		8

TABLE 2.2.15. Species-specific catch per gillnet set at **Big Bay in the Bay of Quinte**, 1992-2011. Annual catches are averages for 2 gillnet gangs set during each of 2-4 visits during summer. Mean catches for 1992-2000 and 2001-2010 time-periods are shown in **bold**. The total number of species caught and gillnets set each year are indicated.

	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Lake sturgeon	**0.02**	-	-	-	-	-	-	-	-	-	-	-	-
Longnose gar	**1.39**	1.00	1.00	0.17	1.00	1.50	3.00	0.33	2.50	3.77	6.50	**2.08**	2.33
Alewife	**0.70**	-	0.88	1.67	3.17	-	0.75	-	1.00	2.67	1.00	**1.11**	0.50
Gizzard shad	**7.23**	2.13	6.63	2.00	0.17	42.17	0.25	1.00	3.67	-	3.33	**6.13**	88.50
Northern pike	**0.68**	0.13	0.13	-	0.17	0.17	0.50	0.17	-	-	-	**0.13**	-
Mooneye	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-
White sucker	**7.30**	3.50	9.25	2.33	5.33	2.50	5.00	2.50	4.33	3.33	3.67	**4.18**	4.00
Silver redhorse	-	-	-	-	-	-	-	-	-	-	0.17	**0.02**	-
Moxostoma sp.	**0.04**	0.13	-	0.17	-	-	-	-	-	-	-	**0.03**	-
Common carp	**0.30**	-	-	0.17	0.17	-	-	-	-	-	-	**0.03**	-
Brown bullhead	**6.72**	6.75	5.50	1.83	2.33	0.83	2.00	0.83	0.67	0.67	-	**2.14**	0.17
Channel catfish	**0.37**	-	0.13	-	0.17	-	0.25	-	-	0.17	-	**0.07**	-
Burbot	**0.04**	-	-	-	-	-	-	-	-	-	-	-	-
White perch	**90.12**	22.00	36.38	59.83	130.50	79.50	196.75	119.00	127.50	123.17	92.00	**98.66**	91.83
White bass	**0.08**	-	0.13	-	-	-	-	0.17	0.17	-	-	**0.05**	-
Rock bass	**0.26**	-	-	-	-	0.17	-	-	-	-	-	**0.02**	-
Pumpkinseed	**3.97**	17.00	8.25	0.83	4.33	0.33	3.25	0.50	1.00	0.67	0.17	**3.63**	0.83
Bluegill	**0.57**	7.13	3.75	0.50	0.33	2.50	6.50	5.33	3.17	5.55	6.67	**4.14**	6.83
Smallmouth bass	**1.11**	0.50	-	-	-	-	0.50	-	-	0.17	-	**0.12**	-
Largemouth bass	**0.02**	-	-	-	-	-	0.25	-	-	-	0.17	**0.04**	-
Black crappie	**0.11**	0.25	0.38	0.33	0.17	0.17	2.25	1.00	0.33	-	-	**0.49**	-
Yellow perch	**138.65**	190.63	182.88	115.33	109.67	103.00	119.00	16.50	63.00	129.54	43.17	**107.27**	47.17
Walleye (Yellow pickerel)	**16.88**	4.50	7.63	6.50	8.00	5.83	10.75	5.33	9.17	8.00	10.83	**7.65**	6.33
Round goby	-	-	-	0.33	0.33	0.50	-	-	-	-	-	**0.12**	-
Freshwater drum	**15.50**	21.25	7.38	7.33	7.33	9.50	19.75	11.33	6.50	8.67	4.83	**10.39**	5.50
Total catch	**292**	277	270	199	273	249	371	164	223	286	173	**248**	254
Number of species	**14**	14	15	15	16	14	16	13	13	12	12	**14**	11
Number of sets		8	8	6	6	6	4	6	6	6	6		6

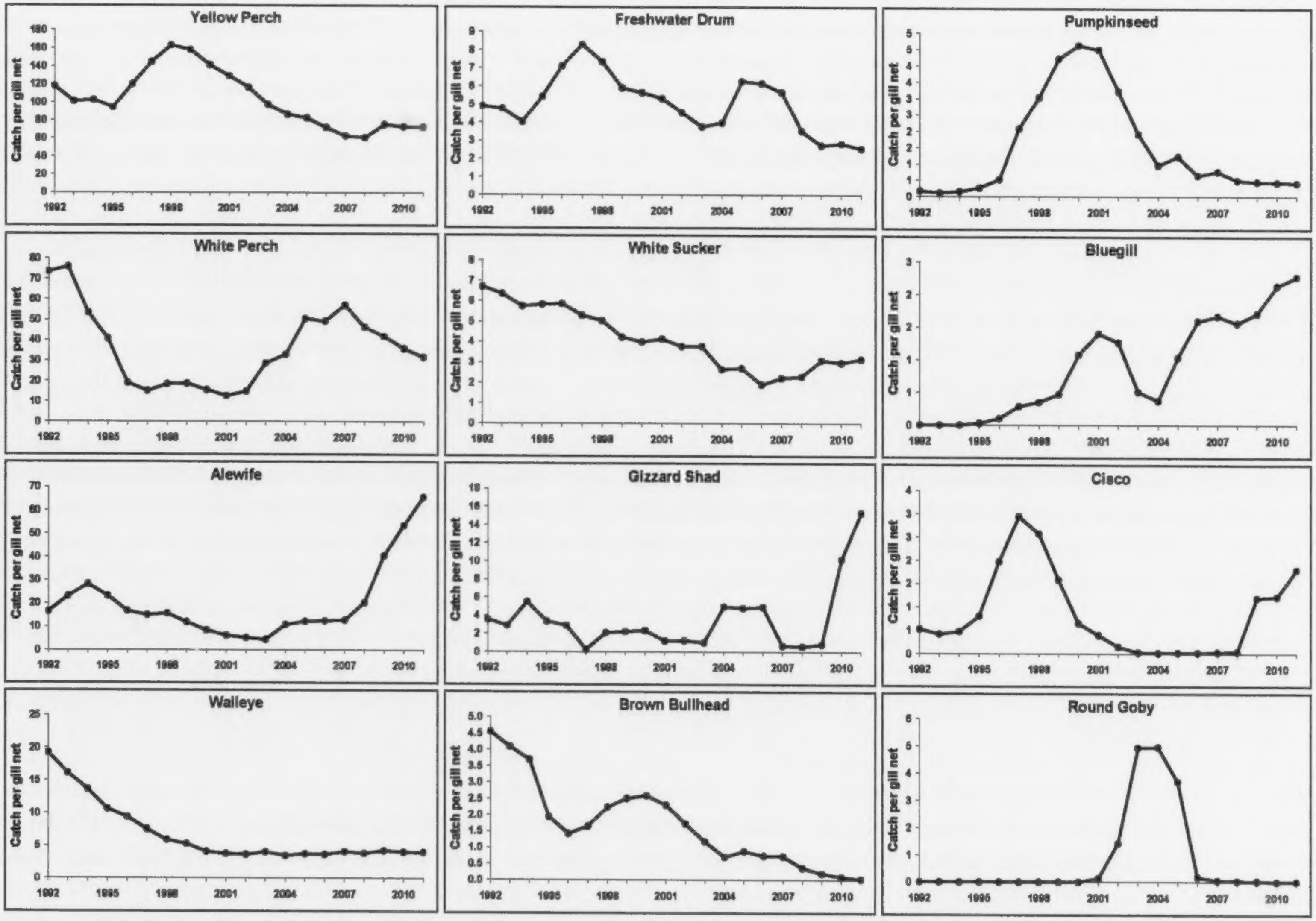

FIG. 2.2.4. Abundance trends for the most common species caught in gillnets at three areas in the Bay of Quinte (Conway, Hay Bay and Big Bay; see Fig. 2.2.1). Values shown here are 3-yr running averages (two years for first and last years graphed).

Species Highlights

Lake Whitefish

Fifty-one Lake Whitefish were caught in the 2011 index gillnets. Eight were from the 2005 year-class and six were from 2003, the next most common year-class. Eight year-old fish from the 2003 year-class were 470 mm fork length and weighed 1249 g (Table 2.2.16 and Fig. 2.2.5). All female fish from the two year-classes were mature (Table 2.2.16 and Fig. 2.2.6). Lake Whitefish condition appears to have stabilized at a level lower than that observed in the early 1990s but significantly higher than that in 1996 and 1997 (Fig. 2.2.7).

Walleye

The age distribution of Walleye (Table 2.2.17) showed a broad range of age-classes from age-1 to age-23. Generally speaking, during the summer index gillnetting program young Walleye were found in the Bay of Quinte (e.g., age-1 to age-5 fish comprised 96% of the Bay of Quinte Walleye catch) while older Walleye were present in eastern Lake Ontario (e.g., age-6 and older fish comprised 94% of the catches in the Kingston Basin). Among young Walleye, all ages were generally quite common indicating that year-class strength has been relatively strong and consistent

TABLE 2.2.16. Age distribution of **51 Lake Whitefish** sampled from summer index gillnets, by region, 2011. Also shown are mean fork length, mean weight, mean GSI (females), and percent mature (females). GSI = gonadal somatic index calculated for **females only** as log10 (gonad weight + 1)/log10(weight). Note that a GSI greater than approximately 0.25 indicates a mature female.

	Age (years) / Year-class																		
	1	2	3	4	5	6	7	8	9	12	16	18	20	21	22	23	24	25	Total
Region	2010	2009	2008	2007	2006	2005	2004	2003	2002	1999	1995	1993	1991	1990	1989	1988	1987	1986	
Bay of Quinte		1	2	2		1													6
Kingston Basin (deep)	1		1		1	4	4	5	4			1	1	1	1		1		25
Kingston Basin (nearshore)			1	1		2	1		1	1									7
Northeast	2				4	1		1			2	1				1			12
Western																		1	1
Total	3	1	4	3	5	8	5	6	5	1	2	2	1	1	1	1	1	1	51
Mean fork length (mm)	173	191	262	264	405	370	401	470	465	489	533	398	561	668	494	564	557	600	
Mean weight (g)	52	63	194	210	757	628	766	1249	1253	1418	1949	2000	1907	3412	1492	1771	2028	2565	
Mean GSI (females)				0.03	0.33	0.42	0.31	0.50	0.52	0.53		0.62			0.56	0.45		0.65	
% mature (females)				0%	67%	100%	50%	100%	100%	100%		100%			100%	100%		100%	

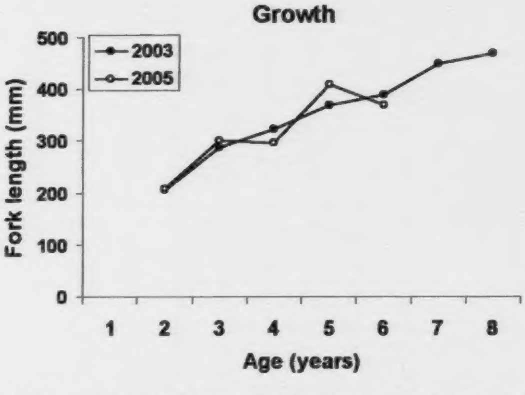

FIG. 2.2.5. Lake Whitefish mean fork length-at-age for the 2003 and 2005 year-classes.

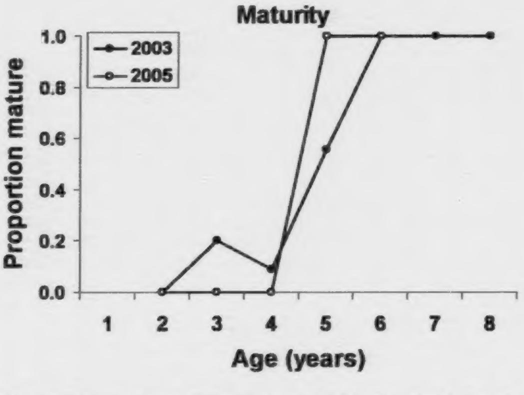

FIG. 2.2.6. Proportion of mature Lake Whitefish (females) by age for the 2003 and 2005 year-classes.

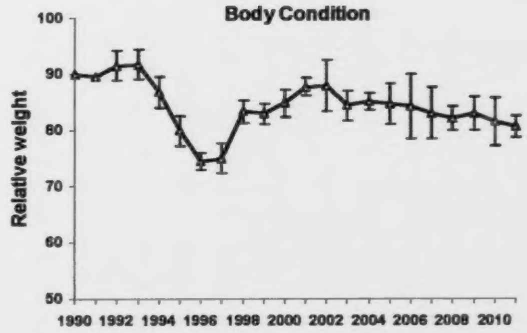

FIG. 2.2.7. Lake Whitefish relative weight (see Rennie and Verdon, 2008) for fish caught in summer index gillnets, 1990-2011.

Rennie, M.D. and R. Verdon. 2008. Development and evaluation of condition indices for the lake whitefish. N. Amer. J. Fish. Manage. 28:1270-1293.

in recent years. The 2006 year-class had the fewest fish while the 2008 and 2010 year-classes appear strong. Older Walleye, from many strong year-classes, were also abundant in eastern Lake Ontario. The 2003 and 1999 year-classes appear particularly strong in Lake Ontario but other prominent year-classes include 2001, 1995 and 1994. Female Walleye begin to mature for the first time during the summer at age-4 to presumably spawn the following spring at age-5.

Round Goby

Only large Round Goby are susceptible to capture in assessments gillnets. Round Goby first appeared in assessment gillnets in the northeast and Bay of Quinte in 2002, Kingston Basin nearshore sites in 2003 (depth range 7.5 to 27.5 m), and in Kingston Basin deep sites (depth about 30 m) in 2004. No Round Goby were captured to date at Middle Ground or the Rocky Point deep sites. In Lake Ontario, goby abundance increased until about 2006 and then declined somewhat (Fig. 2.2.2 and Fig. 2.2.3). In the Bay of Quinte, Round Goby abundance initially increased, peaked in 2004, and then decreased substantially (Fig. 2.2.4).

Lake Trout

The abundance of adult Lake Trout remains low, but there are signs of improvement in recent years (Fig. 2.2.7). The recent low levels were reached around the year 2002, after a period of decline that began in the early 1990s, and which was attributed to reduced stocking levels combined with a decline in early survival of the stocked fish. The current increase in numbers of adults appears to be due to increased early-life survival of stocked fish (Fig. 2.2.8). The early survival of the most recent year-classes (2008, and possibly 2009) appears to be poor again, and it remains to be seen whether this is just a temporary setback. The condition of adult fish continues to improve, (Fig. 2.2.9), and in the last three years it has been the highest over the history of the current data series. Lamprey wounding rates remain under target levels (Fig. 2.2.10), with no A1 wounds observed in 2011.

TABLE 2.2.17. Age distribution of **312 Walleye** sampled from summer index gillnets, by region, 2011. Also shown are mean fork length, mean weight, mean GSI (females), and percent mature (females). GSI = gonadal somatic index calculated for **females only** as log10(gonad weight + 1)/log10(weight). Note that a GSI greater than approximately 0.25 indicates a mature female.

	Age / Year-class																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total
Region	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	
Bay of Quinte	26	14	32	14	1	1		2				1												91
Kingston Basin (nearshore)			4	7	3	14	13	40	4	25	11	33	12	1	5	13	11	6	6	5	1	1	1	216
Kingston Basin (deep)												1												1
Middle Ground																							1	1
Northeast													1						1			1		3
Total	26	14	36	21	4	15	13	42	4	25	11	35	13	1	5	13	11	6	7	5	1	2	2	312
Mean fork length (mm)	234	323	396	472	512	556	593	597	620	598	642	610	643	702	660	642	656	627	632	629	549	665	603	
Mean weight (g)	128	366	702	1336	1859	2379	2857	2957	3406	3036	3688	3149	4311	4538	4059	3583	3886	3297	3456	3501	2394	3772	2595	
Mean GSI (females)	0.04	0.13	0.17	0.27	0.37	0.38	0.42	0.41	0.43	0.40	0.44	0.43	0.45	0.55	0.47	0.46	0.42	0.24	0.47	0.53		0.51	0.29	
% mature (females)	0%	0%	0%	77%	100%	100%	100%	90%	100%	100%	100%	93%	100%	100%	100%	100%	100%	100%	100%	100%		100%	100%	

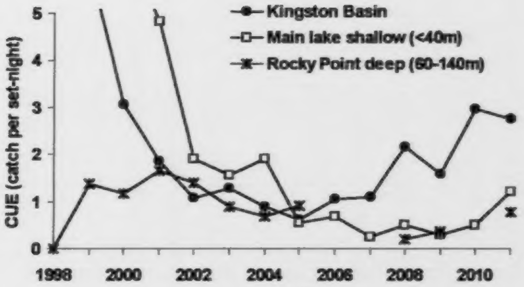

FIG. 2.2.7. Catch per unit effort (# fish per set-night) of adult Lake Trout in bottom-set gillnets in three areas of eastern Lake Ontario. Deep sets off Rocky Point were not fished in 2006, 2007, and 2010.

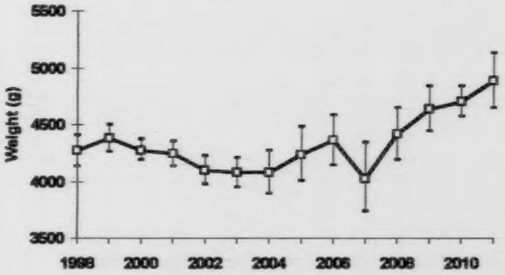

FIG. 2.2.9. Condition of adult Lake Trout expressed as the predicted weight of a 680 mm fish (fork length). The predictions are based on yearly length-weight regressions, and 95% confidence intervals for the predictions are shown.

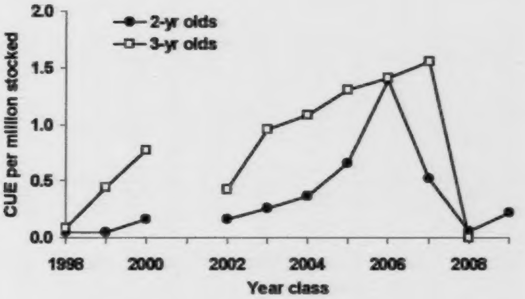

FIG. 2.2.8. Lake Trout relative survival to ages 2 and 3. The survival index is the catch per unit effort of 2 and 3 year old fish, corrected for number stocked 2 or 3 years earlier; age determination is based on of year-specific fin clip information combined with the size of the fish.

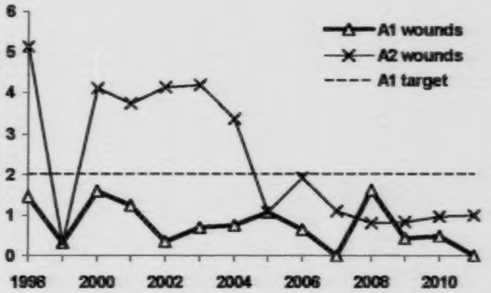

FIG. 2.2.10. Frequency of A1 (fresh) and A2 (partially healed) lamprey wounds observed on Lake Trout. The lamprey control target is 2.0 A1 wounds per 100 fish.

2.3 Eastern Lake Ontario and Bay of Quinte Fish Community Index Trawling

Bottom trawling has been used to monitor the relative abundance of small fish species and the young of large-bodied species in the fish community since the 1960s. After some initial experimentation with different trawl specifications, two trawl configurations (one for the Bay of Quinte and one for Lake Ontario) were routinely employed (see trawl specifications Table 2.3.1).

In the Kingston Basin of eastern Lake Ontario, six sites, ranging in depth from about 20 to 35 m, were visited about four times annually up until 1992 when three sites were dropped. Currently, three visits are made to each of three sites annually, and four replicate ½ mile trawls are made during each visit. After 1995, a deep water site was added, south of Rocky Point (visited twice annually with a trawling distance of 1 mile; 90 m water depth), to give a total of four Lake sites (Fig. 2.3.1). In the Bay of Quinte, six fixed-sites, ranging in depth from about 4 to 21 m, are visited annually on two or three occasions during mid to late-summer. Four replicate ¼ mile trawls are made during each visit to each site.

Species-specific catches in the 2011 trawling program are shown in Tables 2.3.2-2.311. Twenty-nine species and over 109,000 fish were caught in 84 bottom trawls in 2011 (June 27-August 31). Yellow Perch (28%), White Perch (22%), Round Goby (19%), Alewife (16%), Gizzard Shad (8%), Spottail Shiner (2%), Trout-perch (1%), collectively made up 97% of the catch by number.

Lake Ontario

EB02 (Table 2.3.2)

Only three species, Round Goby, Alewife and Rainbow Smelt were caught at EB02 in 2011. Catches of these species were low. Threespine Stickleback, having risen to high levels of abundance in the late 1990s, declined rapidly after 2003 and was absent in the EB02 catches for the last five years. Slimy Sculpin, another formally abundant species has also absent for five years.

TABLE 2.3.1. Bottom trawl specifications used in Eastern Lake Ontario and Bay of Quinte Fish Community sampling.

	3/4 Western (Poly) (Bay Trawl)	3/4 Yankee Standard No. 35 (Lake Trawl)
Head Rope Length (m)	14.24	12
Foot Rope Length (m)	19	17.5
Side Brail Height (m)	2	1.9
Mesh Size (front)	4" knotted black poly	3.5" knotted green nylon
Twine Type (middle)	3" knotted black poly	2.5" knotted nylon
Before Codend	2" knotted black poly 1.5" knotted black nylon 1" knotted black nylon	2" knotted nylon (chafing gear)
Codend Mesh Size	0.5" knotted white nylon	0.5" knotless white nylon
Remarks:	Fishing height 2.0 m FISHNET gear dimensions as per Casselman 92/06/08	Fishing height 1.9 m FISHNET gear dimensions as per Casselman 92/06/08
GRLEN:length of net	N/A	N/A
GRHT:funnel opening height	2.25 m	2.3 m
GRWID:intake width	6.8 m	9.9 m
GRCOL:1 wt,2 bl,3 gn	2	7 (discoloured)
GRMAT:1 nylon,2 ploypr.	2	1
GRYARN:1 mono,2 multi	2	2
GRKNOT:1 knotless,2 knots	2	2

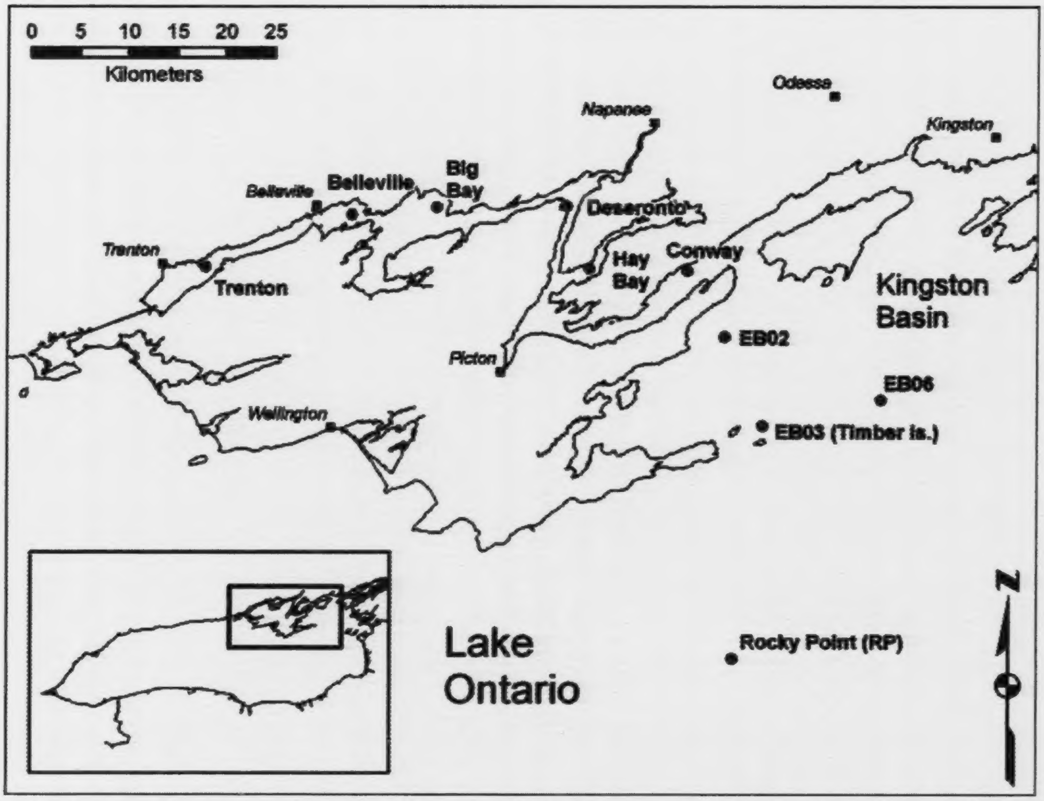
0 5 10 15 20 25
Kilometers
Odessa
Napanee
Kingston
Belleville
Belleville
Big Bay
Deseronto
Trenton
Trenton
Hay Bay
Conway
Kingston Basin
EB02
Picton
EB06
Wellington
EB03 (Timber Is.)
Lake Ontario
Rocky Point (RP)
N

FIG. 2.3.1. Map of north eastern Lake Ontario. Shown are eastern Lake Ontario and Bay of Quinte fish community index bottom trawling site locations.

EB03 (Table 2.3.3)

Eight species were caught at EB03 in 2011. The most abundant species were Round Goby and Rainbow Smelt. Round Goby, having first appeared in the EB03 catches in 2004, now dominate the total catch. As was the case for EB02, Threespine Stickleback have been absent from the EB03 catches for five years. Trout-perch and Slimy Sculpin have also been absent from the catches for the last few years.

EB06 (Table 2.3.4)

As for EB02, only three species, Rainbow Smelt, Round Goby and Alewife, were caught at EB06 in 2011.

Rocky Point (Table 2.3.5)

Five species were caught at Rocky Point in 2011. Remarkably, 30 Deepwater Sculpin, a species of special concern (see Section 8.1) were caught at this deep water sampling location.

Bay of Quinte

Conway (Table 2.3.6)

Eleven species, the most for several years, were caught at Conway in 2011. The most abundant species were Alewife, Round Goby, Yellow Perch and Cisco (Lake Herring).

Hay Bay (Table 2.3.7)

Seventeen species were caught at Hay Bay in 2011. The most abundant species were Alewife and White Perch, Spottail Shiner, Trout-perch and Yellow Perch. Brown Bullhead abundance remained low while White Bass catches were the highest on record.

TABLE 2.3.2. Species-specific catch per trawl (12 min duration; 1/2 mile) by year in the fish community index bottom trawling program during summer at **EB02**, eastern Lake Ontario. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

							Year						
Species	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2001-2010 mean	2011
Alewife	1220.305	203.333	20.917	19.500	27.100	0.000	0.417	11.000	0.667	72.425	463.950	81.931	1.667
Rainbow trout	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lake trout	0.202	0.000	0.083	0.083	0.000	0.583	0.167	0.583	0.500	0.000	0.167	0.217	0.000
Lake whitefish	3.203	0.167	0.000	0.583	0.400	0.250	0.000	0.167	0.000	0.250	0.000	0.182	0.000
Cisco (Lake herring)	0.362	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coregonus sp.	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rainbow smelt	440.899	29.667	7.917	0.917	5.000	19.750	28.750	3.583	5.667	114.408	14.667	23.033	1.083
Emerald shiner	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Burbot	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Threespine stickleback	13.395	18.750	34.417	49.500	6.200	9.000	0.167	0.000	0.000	0.000	0.000	11.803	0.000
Trout-perch	4.675	0.250	0.000	0.167	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042	0.000
Yellow perch	0.019	0.000	0.000	0.000	0.700	0.333	0.083	0.000	0.000	0.000	0.083	0.120	0.000
Walleye	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.008	0.000
Johnny darter	0.077	0.000	0.000	0.000	0.400	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000
Round goby	0.000	0.000	0.000	0.083	250.100	24.833	40.083	119.750	26.667	169.900	143.924	77.534	8.083
Sculpin sp.	0.046	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Slimy sculpin	2.084	0.417	0.667	44.083	74.900	0.750	0.167	0.000	0.000	0.000	0.000	12.098	0.000
Total catch	1685	253	64	115	365	56	70	135	34	357	623	207	11
Number of species	9	6	5	8	8	7	7	5	4	4	6	6	3
Number of trawls		12	12	12	12	12	12	12	12	12	12		12

TABLE 2.3.3. Species-specific catch per trawl (12 min duration; 1/2 mile) by year in the fish community index bottom trawling program during summer at **EB03**, eastern Lake Ontario. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

							Year						
Species	1992-2000 mean	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2001-2010 mean	2011
Alewife	704.382	57.375	21.375	8.000	168.375	14.833	15.250	33.917	156.325	0.000	0.250	47.570	0.125
Gizzard shad	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.025	0.000
Chinook salmon	0.014	0.000	0.000	0.000	0.000	0.667	0.000	0.000	0.000	0.000	0.000	0.067	0.000
Lake trout	0.847	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.083	0.000	0.033	0.000
Lake whitefish	14.412	0.000	0.000	43.938	2.333	50.000	3.000	1.417	0.000	0.083	4.667	10.544	0.125
Cisco (Lake herring)	0.292	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125
Rainbow smelt	517.345	20.000	207.488	109.231	1.917	25.667	20.625	21.500	0.250	11.583	217.933	63.619	30.750
White sucker	0.093	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.000	0.000	0.000	0.008	0.000
Common carp	0.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Spottail shiner	42.449	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.083	0.033	0.375
American eel	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brook stickleback	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Threespine stickleback	32.894	67.375	680.138	459.275	2781.625	116.083	8.500	0.000	0.000	0.000	0.000	411.300	0.000
Trout-perch	689.067	175.000	592.200	56.294	255.083	3.417	3.750	0.417	0.000	0.000	0.000	108.616	0.125
White perch	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pumpkinseed	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.008	0.000
Smallmouth bass	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Largemouth bass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.008	0.000
Yellow perch	0.093	0.000	0.000	0.625	0.083	0.000	0.500	0.167	0.125	0.000	0.000	0.150	0.000
Walleye	0.236	0.000	0.000	0.063	0.000	0.000	0.125	0.000	0.000	0.417	0.000	0.060	0.250
Johnny darter	0.875	0.000	0.000	9.875	32.833	0.167	0.000	0.000	0.000	0.000	0.000	4.288	0.000
Round goby	0.000	0.000	0.000	0.000	0.333	732.358	850.325	910.133	1100.163	2551.917	1079.833	722.506	2322.465
Freshwater drum	0.046	0.000	0.000	0.000	0.083	0.000	0.125	0.000	0.125	0.000	0.000	0.033	0.000
Sculpin sp.	0.194	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mottled sculpin	0.000	0.000	0.000	0.688	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.069	0.000
Slimy sculpin	0.370	0.000	0.250	6.750	10.833	0.083	0.000	0.000	0.000	0.000	0.000	1.792	0.000
Total catch	2004	320	1501	695	3254	943	902	968	1257	2564	1303	1371	2354
Number of species	10	4	5	10	10	9	9	9	5	6	7	7	8
Number of trawls		8	8	16	12	12	8	12	8	12	12		8

TABLE 2.3.4. Species-specific catch per trawl (12 min duration; 1/2 mile) by year in the fish community index bottom trawling program during summer at **EB06**, eastern Lake Ontario. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

		Year											
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Alewife	**85.619**	5.583	0.250	0.083	1.250	0.417	8.000	0.917	0.667	10.833	1.083	**2.908**	0.667
Lake trout	**0.611**	0.083	0.083	0.083	0.083	0.000	0.000	0.000	0.000	0.000	0.000	**0.033**	0.000
Lake whitefish	**4.546**	0.000	0.167	0.167	0.250	0.000	0.000	0.083	0.000	0.000	0.083	**0.075**	0.000
Cisco (Lake herring)	**0.028**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Rainbow smelt	**743.666**	21.417	6.750	0.250	25.083	142.583	23.917	0.583	1.000	3.500	73.167	**29.825**	18.917
Threespine stickleback	**7.722**	2.583	47.750	11.417	7.500	13.917	1.083	0.000	0.000	0.000	0.000	**8.425**	0.000
Trout-perch	**0.991**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Yellow perch	**0.019**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Johnny darter	**0.000**	0.000	0.000	0.000	0.333	0.000	0.000	0.000	0.000	0.000	0.000	**0.033**	0.000
Round goby	**0.000**	0.000	0.000	0.000	0.000	0.000	5.000	82.925	1.667	8.667	877.767	**97.603**	1.917
Sculpin sp.	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Slimy sculpin	**0.083**	0.083	0.000	3.583	399.158	15.750	0.250	0.000	0.000	0.500	1.500	**42.083**	0.000
Deepwater sculpin	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.167	**0.025**	0.000
Total catch	**843**	30	55	16	434	173	38	85	3	24	954	**181**	22
Number of species	**6**	5	5	6	7	4	5	4	3	5	6	**5**	3
Number of trawls		12	12	12	12	12	12	12	12	12	12		12

TABLE 2.3.5. Species-specific catch per trawl (24 min duration; 1mile) by year in the fish community index bottom trawling program during summer at **Rocky Point** (90 m water depth) Lake Ontario. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

		Year											
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Alewife	**1.833**	5.500	0.750	3.000	11.500	0.250	No trawling	13.750	3.000	0.750	No trawling	**4.813**	1.000
Lake trout	**0.167**	1.000	0.000	0.000	0.250	0.000		0.000	0.250	0.000		**0.188**	0.500
Lake whitefish	**0.250**	0.000	0.250	0.000	0.000	0.000		0.000	0.000	0.000		**0.031**	0.000
Rainbow smelt	**408.667**	159.500	75.250	8.250	22.750	11.000		4.500	14.500	13.500		**38.656**	11.000
Threespine stickleback	**0.000**	0.000	0.000	0.000	0.250	0.250		0.000	0.000	0.000		**0.063**	0.000
Slimy sculpin	**9.667**	0.500	0.250	4.500	191.500	28.500		49.500	17.750	10.000		**37.813**	4.500
Deepwater sculpin	**0.000**	0.000	0.000	0.000	0.000	0.250		1.500	0.500	0.250		**0.313**	15.000
Total catch	**421**	167	77	16	226	40		69	36	25		82	32
Number of species	**3**	4	4	3	5	5		4	5	4		7	5
Number of trawls		4	4	4	4	4		4	4	4			4

Deseronto (Table 2.3.8)

Twenty species were caught at Deseronto in 2011. The most abundant species were White Perch, Yellow Perch, Alewife and Trout-perch. Brown Bullhead catch remained low. No American Eel have been caught in the last nine years. White Bass catch was high.

Big Bay (Table 2.3.9)

Eighteen species were caught at Big Bay in 2011. The most abundant species were White Perch, Yellow Perch and Trout-perch. Brown Bullhead catch remained low. No American Eel have been caught in the last nine years. Trout-perch catches have increased in the last few years.

Belleville (Table 2.3.10)

Nineteen species were caught at Belleville in 2011. Gizzard Shad, Yellow Perch, White Perch were the most abundant species in the catch. Catches of Gizzard Shad and Yellow Perch were high relative to previous years. Brown Bullhead catch remained low. No American Eel have been caught in the last 13 years.

TABLE 2.3.6. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Conway** (24 m depth), Bay of Quinte. Catches are the mean number of fish observed at each site for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year												
	1992-2000											**2001-2010**	
Species	**mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011
Silver lamprey	**0.000**	0.000	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	**0.008**	0.000
Alewife	**121.966**	0.000	0.000	2.250	1.917	0.417	9.667	0.083	214.558	1.583	0.333	**23.081**	375.352
Gizzard shad	**0.000**	0.000	0.000	0.000	0.000	0.000	1.167	0.000	0.000	0.000	0.000	**0.117**	0.000
Chinook salmon	**0.028**	0.000	0.000	0.000	0.000	0.167	0.083	0.000	0.000	0.000	0.000	**0.025**	0.000
Brown trout	**0.000**	0.000	0.125	0.167	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.029**	0.000
Lake trout	**0.014**	0.000	0.250	0.000	0.417	0.000	0.000	0.000	0.000	0.000	0.000	**0.067**	0.000
Lake whitefish	**13.208**	1.000	1.000	8.083	0.750	3.083	3.833	4.750	0.250	0.333	0.333	**2.342**	0.625
Cisco (Lake herring)	**2.301**	0.000	0.250	3.000	0.083	7.667	4.500	2.000	0.167	0.000	6.333	**2.400**	8.250
Coregonus sp.	**0.000**	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.008**	0.000
Rainbow smelt	**112.713**	0.000	39.625	10.167	3.583	6.750	0.083	25.167	1.083	0.083	0.000	**8.654**	0.625
White sucker	**4.412**	134.825	28.750	6.667	7.417	4.750	3.167	11.250	0.500	0.000	0.167	**19.749**	0.500
Moxostoma sp.	**0.000**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000
Spottail shiner	**0.000**	0.625	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.063**	0.000
American eel	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Burbot	**0.000**	0.000	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	**0.008**	0.000
Threespine stickleback	**0.019**	0.000	0.000	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.008**	0.000
Trout-perch	**132.800**	139.438	58.225	53.667	43.333	12.250	0.500	1.000	13.000	0.083	0.000	**32.150**	0.500
White perch	**0.116**	0.000	0.000	0.000	0.000	0.000	3.000	0.000	0.000	0.250	0.167	**0.342**	5.500
White bass	**0.000**	0.000	0.000	0.000	0.000	0.000	0.833	0.000	0.000	0.000	0.000	**0.083**	1.125
Rock bass	**0.028**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Yellow perch	**12.597**	134.700	181.238	178.133	58.667	53.750	146.567	20.000	108.975	8.250	56.950	**94.723**	125.915
Walleye	**2.764**	1.250	0.000	0.250	1.000	0.083	0.417	0.417	0.083	0.000	0.333	**0.383**	0.375
Johnny darter	**0.306**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Round goby	**0.000**	0.000	0.500	282.225	79.167	127.208	40.833	173.192	89.717	80.767	146.975	**102.058**	261.710
Freshwater drum	**0.000**	0.125	0.000	0.250	0.000	0.083	0.500	0.000	0.083	0.000	0.000	**0.104**	0.000
Sculpin sp.	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Mottled sculpin	**0.009**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Slimy sculpin	**0.079**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Total catch	**403**	412	310	545	197	216	215	238	428	91	212	**286**	780
Number of species	**9**	8	9	13	12	11	14	9	10	7	8	**10**	11
Number of trawls		8	8	12	12	12	12	12	12	12	12		8

Trenton (Table 2.3.11)

Twenty-two species were caught at Trenton in 2011. The most abundant species were Yellow Perch, White Perch, Spottail Shiner, Pumpkinseed and Alewife.

Species Trends (Fig. 2.3.2)

Bottom trawl results were summarized across the six Bay of Quinte sites and presented graphically to illustrate abundance trends for major species in Fig. 2.3.2. All species show significant abundance changes over the long-term. The most abundant species remain Yellow Perch, White Perch and Alewife with Alewife showing an increase in recent years. Most Centrarchid species are currently at moderate to high levels of abundance as are Gizzard Shad, Spottail Shiner, Round Goby, Logperch, Cisco, and White Bass. Species currently at low abundance levels relative to past levels include Trout-perch, Rainbow Smelt, Brown Bullhead, White Sucker, Lake Whitefish, Johnny Dater and American Eel.

Species Highlights

Catches of age-0 fish in 2011 for selected species and locations are shown in Tables 2.3.12-2.3.15 for Lake Whitefish, Lake Herring, Yellow Perch and Walleye respectively. Age-0 Lake Whitefish catches were low at Conway and none was caught at Timber Island in 2011 (Table 2.3.12). Age-0 Lake Herring catches at Conway were high in 2011 (Table 2.3.13). Age-0 catches of Yellow Perch were very high (Table 2.3.14). Age-0 Walleye catches were moderate to high (Table 2.3.15).

Age-0, age-1, age-2 and age-3 Walleye were all common in the 2011 Bay of Quinte trawls (Table 2.3.16).

TABLE 2.3.7. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Hay Bay** (7 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

Species	1992-2000 mean	Year										2001-2010 mean	2011
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
Alewife	204.132	565.963	21.125	1.750	67.063	72.088	394.425	695.188	631.613	713.000	967.788	413.000	561.676
Gizzard shad	10.153	2.625	0.125	0.000	0.125	0.000	0.375	0.125	7.000	0.750	4.000	1.513	1.375
Lake whitefish	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cisco (Lake herring)	0.056	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.000
Rainbow smelt	3.958	0.000	0.000	0.000	0.000	0.000	0.125	0.000	0.375	0.000	0.000	0.050	0.000
Northern pike	0.069	0.000	0.000	0.125	0.000	0.000	0.000	0.125	0.000	0.125	0.000	0.038	0.000
White sucker	3.579	3.500	0.125	5.875	8.250	0.000	0.625	4.875	3.000	0.000	3.625	2.988	4.375
Common carp	0.343	0.250	0.000	0.000	0.000	0.875	0.000	0.000	0.750	0.125	0.000	0.200	0.000
Golden shiner	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125	0.000	0.013	0.000
Common shiner	0.000	0.000	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.013	0.000
Spottail shiner	32.120	63.513	54.000	53.250	64.375	79.113	133.950	188.575	47.750	46.500	53.375	78.440	47.750
Brown bullhead	15.046	32.750	15.750	8.000	10.375	10.500	15.000	8.875	0.750	3.500	2.500	10.800	0.250
Channel catfish	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125
American eel	1.579	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Burbot	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Trout-perch	65.125	5.750	2.750	3.750	77.500	1.750	3.000	59.500	6.625	3.750	4.375	16.875	22.875
White perch	94.664	9.250	132.563	14.750	495.163	24.625	504.113	27.500	163.738	167.700	54.875	159.428	73.281
White bass	0.185	0.000	0.000	1.750	0.125	0.125	1.375	1.375	0.875	0.500	2.000	0.813	9.500
Sunfish	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rock bass	0.028	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.125	0.025	0.000
Pumpkinseed	10.231	19.625	11.875	0.750	4.625	1.125	44.500	11.375	8.625	0.250	13.250	11.600	0.875
Bluegill	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125	3.625	0.125	0.250	0.413	0.125
Smallmouth bass	0.000	0.000	1.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125	0.000
Largemouth bass	0.000	0.250	1.750	0.000	0.000	0.000	0.000	0.000	0.375	1.375	2.125	0.588	1.000
Black crappie	0.000	0.000	0.000	0.000	0.000	1.375	0.875	0.000	0.000	0.000	0.000	0.225	0.500
Lepomis sp.	0.000	0.000	0.000	0.000	0.000	13.375	0.000	0.000	0.000	0.000	0.000	1.338	0.000
Yellow perch	372.581	726.475	856.588	119.200	551.850	278.638	580.700	906.500	138.063	146.038	206.663	451.071	14.125
Walleye	7.333	7.125	3.250	1.750	3.125	4.125	7.125	8.500	13.375	5.000	8.500	6.188	7.750
Johnny darter	0.079	0.000	1.750	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.188	0.000
Logperch	0.046	0.250	0.000	0.000	0.125	0.375	0.250	1.250	0.250	0.250	0.125	0.288	0.000
Brook silverside	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.875	0.088	0.000
Round goby	0.000	0.125	1.250	14.250	3.500	40.125	6.000	17.125	11.375	1.625	2.375	9.775	0.125
Freshwater drum	2.773	4.375	4.875	6.875	10.500	16.375	39.125	6.000	5.000	5.125	11.125	10.938	8.250
Slimy sculpin	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total catch	824	1443	1109	232	1297	545	1732	1937	1043	1096	1338	1177	754
Number of species	15	16	15	13	15	15	17	17	18	18	18	16	17
Number of trawls		8	8	8	8	8	8	8	8	8	8		8

Round Goby first appeared in bottom trawl catches in the Bay of Quinte in 2001 and in the Kingston Basin of eastern Lake Ontario in 2003. The species was caught at all Bay of Quinte trawling sites by 2003, peaking in abundance, at each site, between 2003 and 2005. Catches have been quite variable since but remain high. Round Goby catches in the Kingston Basin remained very high at EB03 and declined at EB02 and EB06 in 2011.

TABLE 2.3.8. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Deseronto** (5 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

						Year							
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Longnose gar	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Alewife	**120.567**	180.063	47.625	277.350	55.375	54.213	106.263	1037.375	217.088	16.250	447.013	**243.861**	250.241
Gizzard shad	**54.322**	32.000	20.875	11.875	1.375	22.000	62.100	29.250	109.375	47.538	20.500	**35.689**	36.058
Rainbow smelt	**0.028**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Northern pike	**0.028**	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.014
White sucker	**1.028**	0.625	0.375	1.250	1.250	0.125	0.375	0.375	0.625	2.625	0.125	**0.775**	0.790
Common carp	**0.278**	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.125	**0.025**	0.028
Spottail shiner	**29.194**	25.250	25.000	35.625	1.500	18.875	54.750	28.750	104.125	38.625	18.000	**35.050**	36.030
Brown bullhead	**24.250**	69.250	10.625	21.500	37.000	12.500	11.625	18.125	2.500	4.000	1.000	**18.813**	13.769
Channel catfish	**0.083**	0.000	0.000	0.000	0.125	0.250	0.125	0.000	0.000	0.000	0.000	**0.050**	0.055
Ictalurus sp.	**0.000**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.001
American eel	**0.861**	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.014
Trout-perch	**35.125**	4.750	7.500	0.125	4.500	6.000	12.375	18.375	550.213	226.813	1.750	**83.240**	91.089
White perch	**273.129**	10.250	194.863	306.238	3075.588	237.588	793.925	226.200	298.113	811.600	25.250	**597.961**	656.732
White bass	**0.403**	0.000	0.000	0.500	1.625	1.250	4.250	0.375	0.000	1.250	0.250	**0.950**	1.045
Sunfish	**0.125**	0.375	0.000	0.000	0.000	0.000	1.375	0.000	0.125	0.000	0.000	**0.188**	0.169
Rock bass	**0.014**	0.125	1.750	0.250	0.000	0.000	0.000	0.000	0.000	0.500	0.250	**0.288**	0.304
Pumpkinseed	**15.042**	118.088	17.500	67.500	19.500	14.750	15.500	19.125	11.500	30.500	11.000	**32.496**	23.937
Bluegill	**0.014**	0.500	0.125	4.500	0.000	0.125	0.875	0.375	0.000	0.250	1.250	**0.800**	0.830
Smallmouth bass	**0.500**	0.500	0.125	1.000	1.250	0.625	0.250	0.000	0.000	0.250	0.000	**0.400**	0.390
Largemouth bass	**0.083**	0.000	1.125	0.000	0.250	1.125	2.125	0.000	0.125	0.375	2.750	**0.788**	0.866
Black crappie	**0.028**	0.125	0.625	0.125	0.000	1.750	1.375	4.875	0.000	3.375	0.125	**1.238**	1.349
Lepomis sp.	**0.000**	0.000	0.000	0.000	0.000	483.675	0.000	1.000	0.250	0.000	1.875	**48.680**	53.548
Yellow perch	**320.919**	412.700	555.388	683.425	152.138	1030.913	638.313	1087.100	531.750	219.300	66.225	**537.725**	550.228
Walleye	**17.486**	12.500	2.875	7.500	15.125	5.000	5.250	9.875	19.875	15.875	1.875	**9.575**	9.283
Johnny darter	**0.403**	0.625	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.063**	0.006
Logperch	**0.278**	1.000	0.125	0.375	0.000	3.625	0.125	0.750	2.875	23.625	0.250	**3.275**	3.503
Brook silverside	**0.306**	0.000	0.000	0.000	0.000	0.750	0.000	0.000	0.000	0.000	3.000	**0.375**	0.413
Round goby	**0.000**	1.250	11.500	16.125	20.625	117.300	4.625	4.250	4.500	2.750	1.625	**18.455**	20.176
Freshwater drum	**9.111**	16.500	1.875	15.375	15.625	8.250	22.000	24.000	10.125	11.500	0.875	**12.613**	12.224
Total catch	**904**	887	900	1451	3403	2021	1738	2510	1863	1457	605	**1683**	1763
Number of species	**16**	20	19	19	16	22	20	17	16	19	21	**19**	20
Number of trawls		8	8	8	8	8	8	8	8	8	8		8

TABLE 2.3.9. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Big Bay** (5 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year												
Species	**1992-2000 mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**2001-2010 mean**	2011
Longnose gar	**0.111**	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	**0.025**	0.000
Alewife	**33.495**	0.000	224.938	0.000	407.363	35.750	13.000	0.375	190.263	37.875	332.700	**124.226**	52.055
Gizzard shad	**228.178**	0.000	52.250	23.250	58.375	25.875	2.250	2.250	68.738	0.000	66.213	**29.920**	52.250
Rainbow smelt	**0.039**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Northern pike	**0.056**	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000
White sucker	**4.031**	0.750	2.875	1.125	1.375	0.875	0.125	0.375	0.375	0.625	3.750	**1.225**	2.500
Moxostoma sp.	**0.007**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Common carp	**0.545**	0.250	0.000	0.500	0.375	0.250	0.875	0.125	0.375	0.000	1.000	**0.375**	1.375
Emerald shiner	**0.042**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Spottail shiner	**16.069**	12.125	63.625	8.875	20.250	56.250	18.625	15.375	10.625	19.500	37.625	**26.288**	53.750
Brown bullhead	**29.570**	16.375	32.625	38.000	23.750	12.125	54.625	9.750	8.750	3.000	4.750	**20.375**	4.250
Channel catfish	**0.151**	0.000	0.125	0.000	0.000	0.125	0.375	0.000	0.000	0.000	0.000	**0.063**	0.000
Ictalurus sp.	**0.000**	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.038**	0.000
American eel	**0.337**	0.125	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.025**	0.000
Trout-perch	**23.320**	1.375	9.125	5.000	3.125	21.625	21.000	14.000	65.875	67.750	45.625	**25.450**	86.750
White perch	**446.613**	18.250	793.025	145.125	1498.975	554.588	1252.238	363.425	456.700	1116.888	190.763	**638.998**	1552.354
White bass	**1.221**	0.000	2.125	0.000	0.250	2.625	3.875	0.250	0.750	8.250	0.375	**1.850**	2.375
Sunfish	**1.708**	50.000	0.000	0.000	0.000	0.000	25.250	0.000	9.750	0.000	0.000	**8.500**	0.000
Rock bass	**0.000**	0.000	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000
Pumpkinseed	**18.612**	83.875	64.125	67.625	36.625	3.750	6.875	1.875	5.750	12.125	5.875	**28.850**	10.250
Bluegill	**1.930**	124.875	13.625	14.625	0.750	9.625	6.750	16.000	3.875	10.375	4.250	**20.475**	13.000
Smallmouth bass	**0.032**	0.125	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.038**	0.000
Largemouth bass	**0.000**	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.125	1.500	1.625	**0.375**	0.125
Black crappie	**0.356**	0.625	0.500	0.375	0.375	1.000	2.625	0.250	0.125	0.250	0.000	**0.613**	0.000
Lepomis sp.	**0.000**	0.000	66.625	0.000	0.000	1060.175	0.000	4.125	56.475	41.500	170.450	**139.935**	0.500
Yellow perch	**62.998**	381.125	153.463	107.650	200.250	90.613	99.388	33.750	660.600	197.775	184.238	**210.885**	435.501
Walleye	**10.485**	7.500	6.125	19.250	16.875	6.500	8.125	8.750	28.125	10.750	7.250	**11.925**	26.750
Johnny darter	**0.037**	1.250	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.150**	0.000
Logperch	**0.053**	0.125	0.000	0.250	0.000	0.000	0.125	0.250	3.250	2.250	0.000	**0.625**	0.125
Brook silverside	**0.069**	0.000	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.375	**0.050**	0.000
Round goby	**0.000**	0.000	0.125	1.375	15.750	9.500	4.750	50.413	1.125	0.625	0.375	**8.404**	0.750
Freshwater drum	**10.894**	21.750	24.375	9.000	15.625	125.500	178.450	139.350	14.625	11.625	51.500	**59.180**	15.750
Total catch	**891**	721	1511	442	2300	2017	1699	661	1586	1543	1109	**1359**	2310
Number of species	**18**	18	23	15	17	18	20	19	20	17	18	**19**	18
Number of trawls		8	8	8	8	8	8	8	8	8	8		8

TABLE 2.3.10. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Belleville** (5 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

	Year												
	1992-2000											**2001-2010**	
Species	**mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011
Sea lamprey	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Longnose gar	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.000	**0.600**	0.000
Alewife	**92.032**	0.250	82.375	0.125	11.500	13.875	9.750	0.125	34.875	78.775	59.813	**29.146**	128.250
Gizzard shad	**266.406**	99.200	234.363	46.025	581.775	50.563	88.325	73.313	326.875	321.425	500.788	**232.265**	920.843
Rainbow smelt	**0.111**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Northern pike	**0.111**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Mooneye	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
White sucker	**2.648**	0.375	0.375	0.500	0.125	0.000	0.750	0.250	0.250	0.125	0.625	**0.338**	0.125
Common carp	**0.319**	0.125	0.125	0.625	0.000	0.500	0.625	0.250	0.125	1.000	1.500	**0.488**	0.000
Spottail shiner	**71.583**	10.625	21.500	4.750	3.875	13.250	23.875	3.750	17.375	33.375	8.125	**14.050**	26.750
Brown bullhead	**17.824**	32.000	10.875	5.375	17.875	15.000	14.875	9.375	6.000	2.750	6.250	**12.038**	1.250
Channel catfish	**0.069**	0.000	0.125	0.125	0.000	0.375	0.000	0.000	0.000	0.000	0.000	**0.063**	0.000
American eel	**0.194**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Burbot	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Trout-perch	**78.532**	13.000	5.500	12.750	14.375	9.750	4.000	14.250	19.000	32.125	18.625	**14.338**	32.000
White perch	**306.882**	6.625	154.625	165.013	1929.950	475.900	880.563	338.925	845.013	1601.363	104.275	**650.225**	394.588
White bass	**1.509**	0.125	3.000	1.625	3.625	2.000	6.000	0.250	1.000	13.375	3.875	**3.488**	13.750
Sunfish	**4.472**	48.125	0.000	14.625	0.000	0.000	14.500	0.000	42.125	0.000	0.000	**11.938**	0.000
Rock bass	**0.236**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.125
Pumpkinseed	**26.421**	21.750	5.125	1.875	4.125	1.750	1.125	0.875	0.500	0.250	0.375	**3.775**	0.500
Bluegill	**13.429**	0.250	0.500	0.125	0.000	0.375	1.250	1.875	0.000	0.000	0.625	**0.500**	0.375
Smallmouth bass	**0.296**	0.125	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.025**	0.000
Largemouth bass	**0.157**	0.125	0.375	0.250	0.625	0.375	0.000	0.125	0.625	0.000	1.500	**0.400**	0.375
Black crappie	**3.389**	0.375	0.000	0.000	0.250	0.125	2.000	0.375	0.250	0.125	0.000	**0.350**	0.000
Lepomis sp.	**0.014**	0.000	88.375	0.000	2.375	409.700	0.250	5.125	9.000	17.875	293.888	**82.659**	13.375
Yellow perch	**116.481**	37.875	53.250	14.250	66.250	47.375	14.625	78.750	214.725	44.375	300.438	**87.191**	637.039
Walleye	**13.352**	5.375	0.750	8.500	2.625	2.000	2.750	8.625	18.125	3.500	10.375	**6.263**	8.750
Johnny darter	**1.481**	12.500	2.125	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**1.475**	0.000
Logperch	**0.347**	0.250	0.500	0.125	0.125	0.125	0.000	0.750	1.000	1.000	0.250	**0.413**	0.125
Brook silverside	**0.139**	0.000	0.500	0.000	0.000	0.000	1.250	0.000	0.000	0.000	8.500	**1.025**	0.125
Round goby	**0.000**	0.000	1.625	67.000	47.250	60.250	7.125	53.875	8.625	30.500	5.875	**28.213**	1.250
Freshwater drum	**23.412**	163.750	58.250	20.875	4.375	214.763	87.000	830.063	25.000	31.000	53.375	**148.845**	13.875
Sculpin sp.	**0.019**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Total catch	**1042**	453	724	365	2691	1318	1161	1421	1570	2213	1385	**1330**	2193
Number of species	**19**	20	22	20	17	19	19	19	19	17	20	**19**	19
Number of trawls		8	8	8	8	8	8	8	8	8	8		8

TABLE 2.3.11. Species-specific catch per trawl (6 min duration; 1/4 mile) by year in the fish community index bottom trawling program at **Trenton** (4 m depth), Bay of Quinte. Catches are the mean number of fish observed for the number of trawls indicated. Total catch and number of species caught are indicated.

						Year							
	1992-2000											**2001-2010**	
Species	**mean**	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	**mean**	2011
Alewife	**66.908**	149.288	98.600	174.113	8.625	508.825	126.625	24.500	8.750	112.363	26.875	**123.856**	49.500
Gizzard shad	**165.272**	4.125	6.375	22.250	0.000	30.375	23.375	1.375	38.500	5.750	84.225	**21.635**	25.625
Rainbow smelt	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Northern pike	**0.069**	0.000	0.000	0.000	0.000	0.125	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000
Mooneye	**0.056**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
White sucker	**3.000**	0.500	1.625	0.625	1.125	1.875	2.125	2.125	0.375	0.500	0.750	**1.163**	0.625
Minnow	**0.014**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Common carp	**0.278**	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.125	**0.063**	0.125
Spottail shiner	**88.467**	217.400	60.875	60.875	1.250	24.500	41.750	0.000	76.000	148.400	120.050	**75.110**	158.481
Brown bullhead	**26.431**	10.625	3.500	4.250	1.125	8.750	3.750	4.500	1.375	0.875	1.500	**4.025**	2.375
Channel catfish	**0.236**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
American eel	**0.250**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.000**	0.000
Banded killifish	**0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125	**0.013**	0.000
Burbot	**0.000**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000
Trout-perch	**27.139**	0.500	0.500	0.000	0.000	0.125	0.125	0.000	0.250	1.625	1.500	**0.463**	3.250
White perch	**321.078**	54.250	19.875	240.000	80.775	278.988	388.213	29.875	33.750	669.275	16.250	**181.125**	261.900
White bass	**0.403**	0.000	0.125	0.000	0.000	0.000	1.250	0.125	0.000	0.875	0.125	**0.250**	1.625
Sunfish	**13.764**	33.250	0.000	22.375	0.000	0.000	11.500	0.000	0.875	0.000	0.000	**6.800**	0.000
Rock bass	**0.889**	0.625	0.625	0.125	0.000	0.500	2.250	0.000	1.250	2.875	2.250	**1.050**	4.000
Pumpkinseed	**86.344**	84.750	32.250	88.875	56.788	46.750	20.000	77.513	143.775	66.250	62.250	**67.920**	67.062
Bluegill	**0.750**	1.125	0.500	1.500	0.875	0.375	3.875	5.250	2.625	0.625	5.125	**2.188**	11.875
Smallmouth bass	**0.556**	0.375	0.250	0.500	0.500	0.125	0.000	0.000	0.125	0.250	0.000	**0.213**	0.125
Largemouth bass	**2.236**	2.375	2.875	4.625	0.125	6.625	4.250	0.125	6.375	2.750	6.875	**3.700**	14.125
Black crappie	**1.681**	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.013**	0.000
Lepomis sp.	**0.764**	0.000	64.788	0.000	0.000	59.750	10.250	0.000	17.000	0.625	7.125	**15.954**	24.875
Yellow perch	**317.754**	200.625	239.000	544.613	186.375	340.825	130.125	584.738	769.538	1095.063	335.263	**442.616**	1169.504
Walleye	**9.764**	9.625	3.625	10.500	1.500	1.875	0.750	4.750	7.375	6.125	2.125	**4.825**	8.000
Johnny darter	**5.458**	2.500	7.250	7.625	0.375	0.000	0.000	0.000	0.000	0.000	0.000	**1.775**	0.250
Logperch	**3.097**	2.000	0.000	15.250	4.250	52.750	0.625	5.625	23.375	32.375	6.875	**14.313**	24.375
Brook silverside	**0.000**	0.000	0.000	0.250	0.000	0.000	0.000	0.125	0.000	0.000	0.125	**0.050**	0.125
Round goby	**0.000**	0.000	0.000	2.875	8.500	13.125	5.250	0.750	12.375	34.125	7.375	**8.438**	18.750
Freshwater drum	**11.931**	6.750	3.625	2.000	0.375	4.125	4.875	9.500	1.500	4.875	1.375	**3.900**	2.125
Total catch	**1155**	781	547	1203	353	1380	781	751	1145	2186	688	**981**	1849
Number of species	**20**	20	19	19	15	19	20	15	19	19	21	**19**	22
Number of trawls		8	8	8	8	8	8	8	8	8	8		8

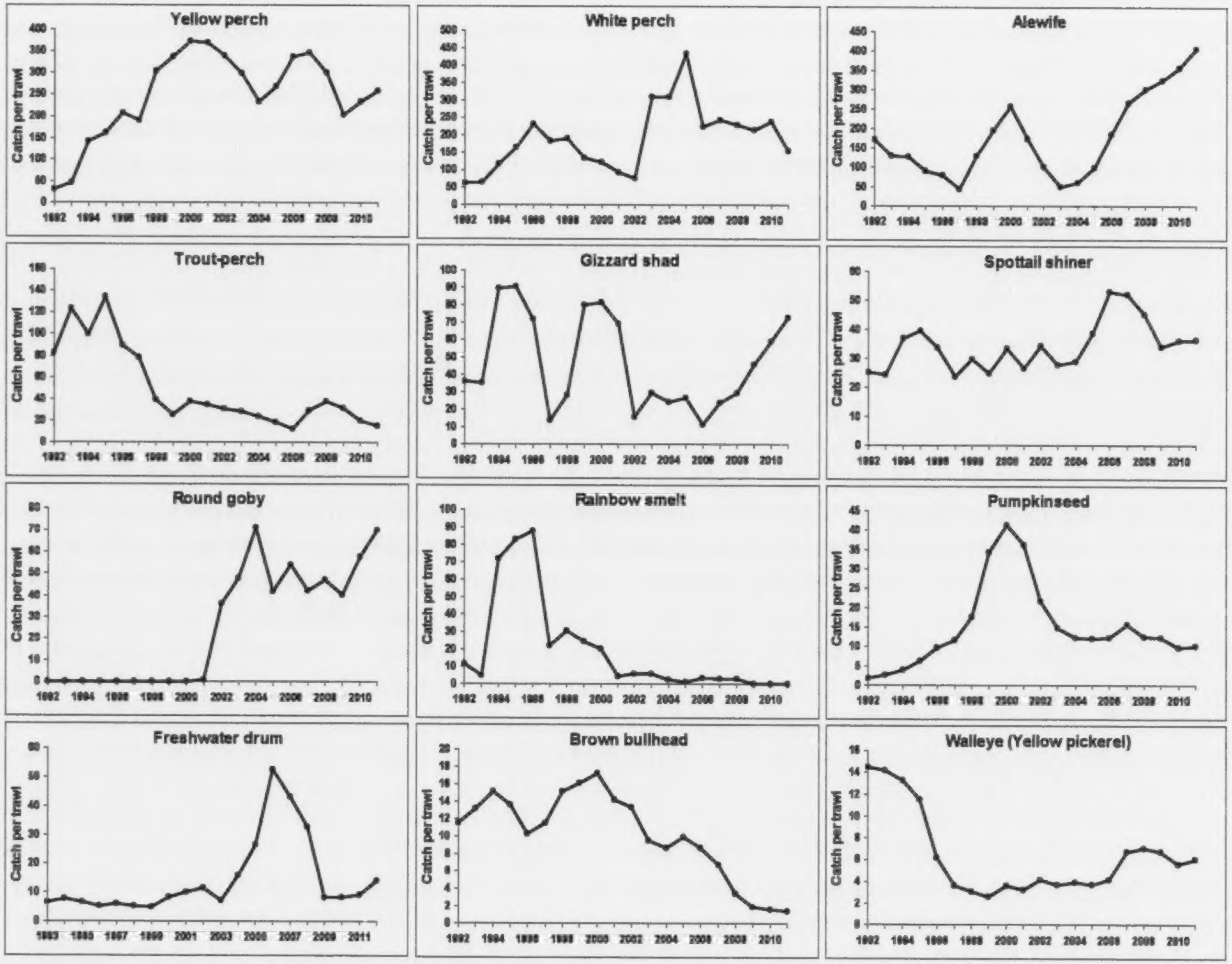

FIG. 2.3.2. Abundance trends for the most common species caught in bottom trawls at six sites in the Bay of Quinte (Conway, Hay Bay, Deseronto, Big Bay, Belleville and Trenton; see Fig. 2.3.1). Values shown here are 3-yr running averages (two years for first and last years graphed).

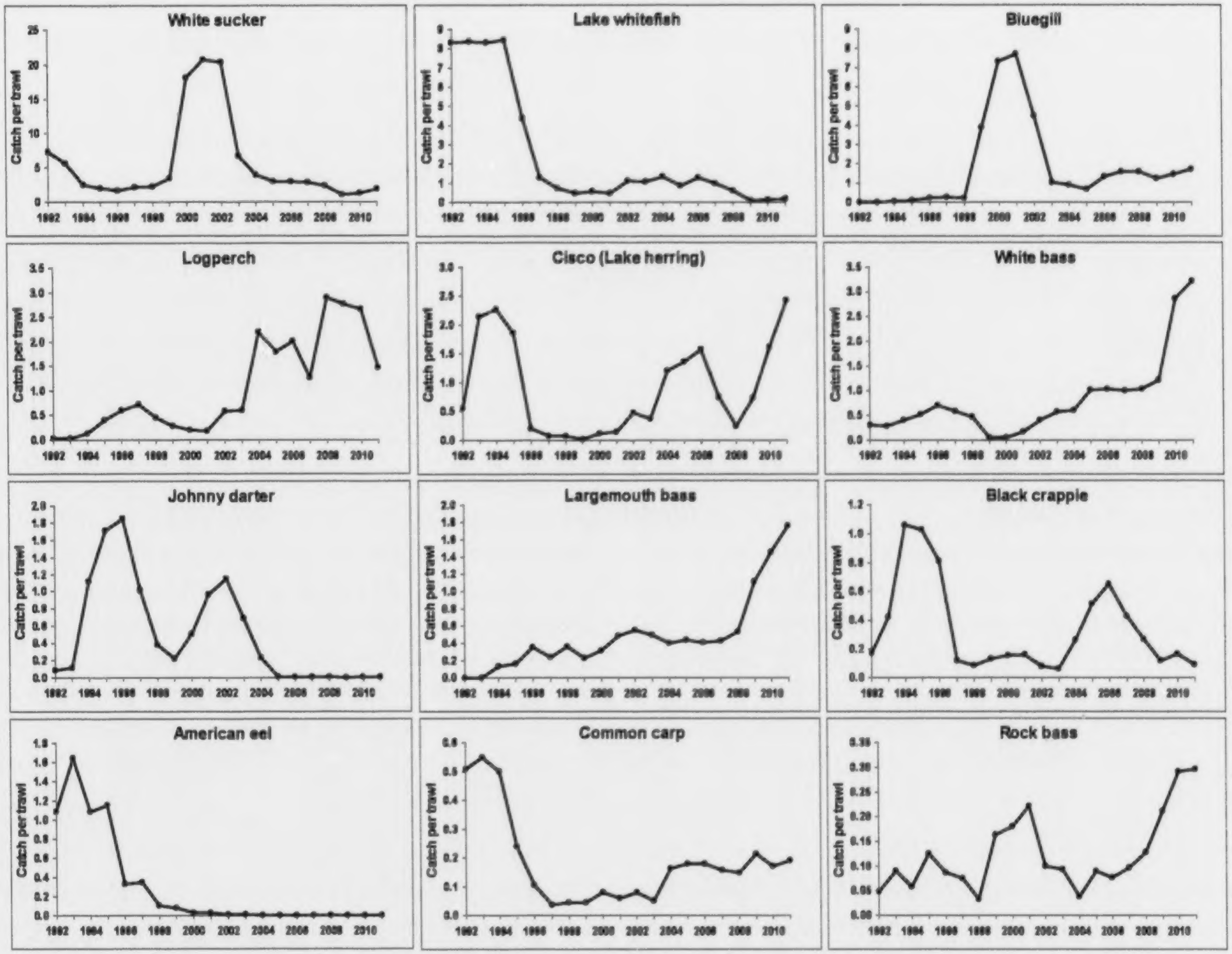

FIG. 2.3.2 (continued). Abundance trends for the most common species caught in bottom trawls at six sites in the Bay of Quinte (Conway, Hay Bay, Deseronto, Big Bay, Belleville and Trenton; see Fig. 2.3.1). Values shown here are 3-yr running averages (two years for first and last years graphed).

TABLE 2.3.12. Mean catch-per-trawl of **age-0 Lake Whitefish** at two sites, Conway in the lower Bay of Quinte and EB03 near Timber Island in eastern Lake Ontario, 1992-2011. Four replicate trawls on each of two to four visits during August and early September were made at each site. Distances of each trawl drag were 1/4 mile for Conway and 1/2 mile for EB03.

	Conway	N	EB03 (Timber Island)	N
1992	23.4	8	0.9	12
1993	3.1	8	4.7	12
1994	40.5	8	79.7	8
1995	27.1	8	17.1	8
1996	2.6	8	0.8	8
1997	5.1	8	6.0	8
1998	0.4	8	0.0	8
1999	0.0	8	0.0	8
2000	0.4	8	0.0	8
2001	0.1	8	0.0	8
2002	0.1	8	0.0	8
2003	8.1	12	44.9	16
2004	0.0	12	2.1	12
2005	2.8	12	49.8	12
2006	2.4	12	3.6	8
2007	0.8	12	0.3	12
2008	0.1	12	0.0	8
2009	0.3	12	0.1	12
2010	0.3	12	4.7	12
2011	0.1	8	0.0	8

TABLE 2.3.13. Mean catch-per-trawl of **age-0 Lake Herring** at Conway in the lower Bay of Quinte, 1992-2011. Four replicate trawls on each of two to four visits during August and early September were made at the Conway site. Distances of each trawl drag was 1/4 mile.

	Conway	N
1992	0.0	8
1993	1.5	8
1994	7.7	8
1995	1.3	8
1996	0.0	8
1997	0.0	8
1998	0.1	8
1999	0.0	8
2000	0.0	8
2001	0.0	8
2002	0.1	8
2003	2.8	12
2004	0.1	12
2005	7.2	12
2006	4.5	12
2007	2.0	12
2008	0.2	12
2009	0.0	12
2010	6.33	12
2011	8.25	8

TABLE 2.3.14. Mean catch-per-trawl of **age-0 Yellow Perch** at six Bay of Quinte sites, 1992-2011. Four replicate trawls on each of two to three visits during August and early September were made at each site. Distance of each trawl drag was 1/4 mile.

	Trenton	Belleville	Big Bay	Deseronto	Hay Bay	Conway	Mean	Number of trawls
1992	3.1	1.3	0.4	0.1	0.5	0.0	0.9	48
1993	203.7	14.0	0.4	36.3	1.6	0.3	42.7	48
1994	526.6	50.6	10.3	101.5	29.3	6.9	120.8	48
1995	730.4	101.1	9.5	764.5	268.9	0.0	312.4	48
1996	2.6	2.9	4.3	2.5	8.5	0.1	3.5	48
1997	302.0	4.0	36.0	135.0	526.0	0.0	167.2	48
1998	13.1	14.0	11.5	0.1	2.9	0.0	7.0	48
1999	24.5	7.0	4.9	638.7	900.3	0.0	262.6	48
2000	0.0	5.8	5.4	0.8	6.0	0.3	3.0	48
2001	158.0	27.6	16.8	71.8	127.0	0.0	66.9	48
2002	0.0	0.3	9.2	141.8	241.1	0.0	65.4	48
2003	228.5	3.8	0.9	9.2	1.6	0.5	40.8	52
2004	0.0	0.9	4.5	8.4	18.0	0.0	5.3	52
2005	202.8	37.5	24.8	444.7	61.9	0.0	128.6	52
2006	3.8	3.5	51.7	532.8	306.0	0.2	149.7	52
2007	284.3	70.9	29.6	883.5	776.0	0.1	340.7	52
2008	123.8	153.4	114.5	263.6	12.4	0.0	111.3	52
2009	101.3	29.8	130.2	81.1	14.3	0.0	59.4	52
2010	216.8	280.3	167.0	34.6	148.8	0.0	141.2	52
2011	729.7	582.4	382.3	1216.8	4.8	1.7	486.3	53

TABLE 2.3.15. Mean catch-per-trawl of **age-0 Walleye** at six Bay of Quinte sites, 1992-2011. Four replicate trawls on each of two to three visits during August and early September were made at each site. Distance of each trawl drag was 1/4 mile.

	Trenton	Belleville	Big Bay	Deseronto	Hay Bay	Conway	Mean	Number of trawls
1992	6.8	12.4	14.0	37.9	6.1	0.8	13.0	48
1993	8.8	16.0	5.0	11.3	1.1	11.9	9.0	48
1994	17.0	21.0	15.0	23.8	11.5	12.5	16.8	48
1995	14.1	8.3	2.6	8.3	5.5	0.9	6.6	48
1996	4.3	7.6	4.9	1.1	0.0	1.1	3.2	48
1997	2.8	7.6	6.1	0.3	0.1	0.0	2.8	48
1998	0.1	0.4	0.6	0.1	0.0	0.0	0.2	48
1999	1.1	0.4	0.4	1.4	9.1	0.1	2.1	48
2000	0.0	3.8	1.0	0.0	0.1	0.0	0.8	48
2001	9.5	4.5	4.8	6.8	3.3	0.1	4.8	48
2002	0.0	0.0	1.1	0.1	0.0	0.0	0.2	48
2003	10.3	8.3	16.8	1.9	0.4	0.0	6.3	52
2004	0.0	0.6	11.4	1.4	0.9	0.0	2.4	52
2005	0.8	1.4	3.8	1.8	1.1	0.0	1.5	52
2006	0.0	1.0	3.0	2.8	5.9	0.3	2.1	52
2007	4.1	6.1	5.4	5.6	5.6	0.2	4.5	52
2008	5.5	17.6	20.5	14.6	12.4	0.0	11.8	52
2009	2.5	2.3	7.6	1.0	2.9	0.0	2.7	52
2010	1.4	4.6	4.5	1.0	3.6	0.0	2.5	52
2011	6.1	8.6	24.5	8.0	4.0	0.1	8.6	53

TABLE 2.3.16. Age distribution of 251 **Walleye** sampled from summer bottom trawls, Bay of Quinte, 2011. Also shown are mean fork length and mean weight. Fish of less than 170 mm fork length (n = 155) were assigned an age of 0, fish between 170 and 280 mm (n = 53) were aged using scales; and those over 280 mm fork length (n = 43)were aged using otoliths.

	Age / year-class										
	0	1	2	3	4	5	7	13	17	20	
	2011	2010	2009	2008	2007	2006	2004	1998	1994	1991	Total
Number of fish	155	55	22	12	2	1	1	1	1	1	251
Mean fork length (mm)	121	248	329	401	447	485	480	587	660	629	
Mean Weight (g)	18	160	387	717	1084	1304	1146	2573	2541	3597	

2.4 Lake Ontario Nearshore Community Index Netting

The provincial standard nearshore community index netting program (NSCIN) was initiated on the upper Bay of Quinte (Trenton to Deseronto) in 2001, and was expanded to include the lower Bay of Quinte (Deseronto to Lake Ontario) in 2002. Both upper and lower Bay of Quinte were sampled from 2002-2005. In 2006, the NSCIN program was conducted on Hamilton Harbour and the Toronto waterfront area thanks to partnerships developed with the Department of Fisheries and Oceans Canada and the Toronto Region Conservation Authority. In 2007, NSCIN was conducted in five areas: Lake St. Francis (St. Lawrence River), the upper Bay of Quinte, East and West Lakes (two Lake Ontario embayments on the southwest side of Prince Edward County), and the Toronto waterfront area. In 2008, NSCIN was conducted in five areas: Lake St. Francis (St. Lawrence River), the upper Bay of Quinte, Weller's Bay, Presqu'ile Bay, and Hamilton Harbour. In 2009, five areas were completed: upper Bay of Quinte, lower Bay of Quinte, Prince Edward Bay, North Channel/Kingston, and the Thousand Islands. In 2010, three areas were completed: Hamilton Harbour, the Toronto Waterfront, and the upper Bay of Quinte. In 2011, two areas were completed: upper and lower Bay of Quinte (Fig. 2.4.1).

The NSCIN program utilized 6-foot trap nets and was designed to evaluate the abundance and other biological attributes of fish species that inhabit the littoral area. Suitable trap net sites were chosen from randomly selected UTM grids that contained shoreline in the area netted.

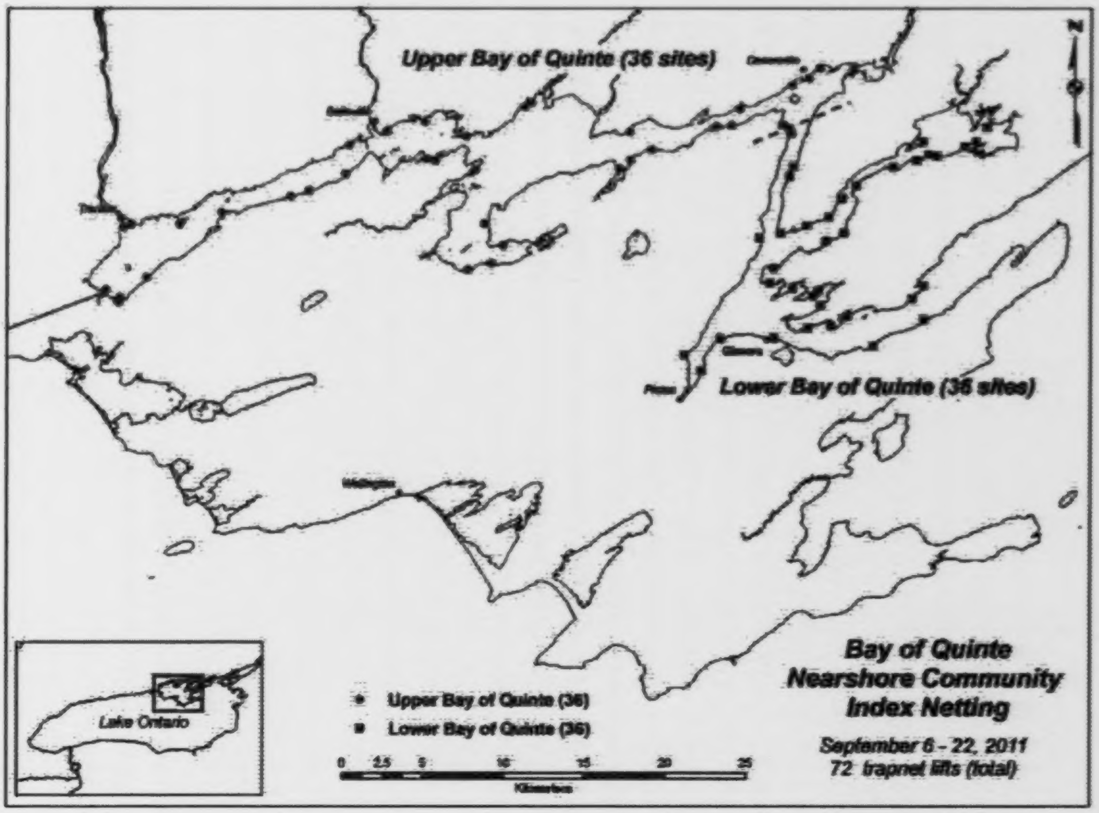
Upper Bay of Quinte (36 sites)
Lower Bay of Quinte (36 sites)
N
Lake Ontario
Upper Bay of Quinte (36)
Lower Bay of Quinte (36)
0
2.5
5
10
15
20
25
Kilometers
Bay of Quinte
Nearshore Community
Index Netting
September 6 - 22, 2011
72 trapnet lifts (total)

FIG. 2.4.1. Map of Bay of Quinte, Lake Ontario indicating NSCIN trapnet locations in the upper and lower regions, 2011 .

Upper Bay of Quinte

Thirty-six trap net sites were sampled on the upper Bay of Quinte from 6 Sep to 23 Sep with water temperatures ranging from 15.6-21.3 °C (Table 2.4.1). More than 8,200 fish comprising 25 species were captured (Table 2.4.2). The most abundant species by number were Bluegill (4,897), Pumpkinseed (1,351), Brown Bullhead (493), Largemouth Bass (374), Black Crappie (311), Yellow Perch (225) and Rock Bass (162). All four species of Redhorse were caught. Four American Eel, likely stocked fish, were also caught.

TABLE 2.4.1. Survey information for the 2011 NSCIN trapnet program on the upper and lower Bay of Quinte.

		Upper Bay of Quinte	Lower Bay of Quinte
Survey dates		6 Sep-23 Sep	6 Sep-23 Sep
Water temperature (°C)		15.6-21.3 °C	17.8-20.9°C
No. of trapnet lifts		36	36
No. sites by depth (m):			
	Target (2-2.5 m)	18	21
	> Target	8	8
	< Target	10	7
No. sites by substrate:			
	Hard	15	16
	Soft	21	20
No. sites by cover:			
	None	1	0
	1-25%	11	9
	25-75%	16	27
	>75%	8	0

Lower Bay of Quinte

Thirty-six trap net sites were sampled on the lower Bay of Quinte from 6 Sep to 23 Sep with water temperatures ranging from 17.8-20.9 °C (Table 2.4.1). Nearly 4,000 fish comprising 24

TABLE 2.4.2. Species-specific catch in the 2011 NSCIN trapnet program on the upper and lower Bay of Quinte. Statistics shown arithmetic and geometric mean catch-per-trapnet (CUE), percent relative standard error of mean log10(catch+1), %RSE = 100*SE/mean, and mean fork or total length (mm). A total of 26 species were caught.

	Upper Bay of Quinte				Lower Bay of Quinte			
	Arithmetic mean CUE	Geometric mean CUE	RSE (%)	Mean length (mm)	Arithmetic mean CUE	Geometric mean CUE	RSE (%)	Mean length (mm)
Longnose gar	0.500	0.216	42	766	0.389	0.299	23	669
Bowfin	0.750	0.493	22	616	1.556	1.098	14	598
Gizzard shad	0.139	0.101	42	206	0.750	0.416	27	178
Brown trout					0.028	0.019	100	640
Northern pike	0.778	0.608	16	581	0.694	0.520	18	554
White sucker	0.417	0.258	32	399	1.472	0.815	21	400
Silver redhorse	0.167	0.114	43	473	0.111	0.080	48	505
Shorthead redhorse	0.194	0.126	43	424				
Greater redhorse	0.444	0.240	37	488				
River redhorse	0.139	0.080	60	606	0.028	0.019	100	430
Common carp	0.222	0.167	32	440	0.333	0.240	28	668
Golden shiner	0.139	0.092	49	160	0.333	0.170	45	158
Brown bullhead	13.694	6.323	10	280	4.250	2.884	10	279
Channel catfish	0.583	0.231	42	576	0.389	0.220	37	591
American eel	0.111	0.080	48	650	0.028	0.019	100	720
White perch	3.750	1.064	24	206	3.750	1.410	19	223
White bass	0.167	0.087	62	177	0.056	0.039	70	135
Rock bass	4.500	2.759	12	166	4.167	2.444	12	166
Pumpkinseed	37.528	16.531	9	148	25.944	12.255	9	146
Bluegill	136.028	61.906	6	140	46.806	24.238	7	161
Smallmouth bass	0.472	0.276	32	335	0.139	0.092	49	382
Largemouth bass	10.389	5.524	10	225	4.333	2.876	10	238
Black crappie	8.639	4.917	10	211	7.028	3.671	12	235
Yellow perch	6.250	2.567	15	201	3.667	2.430	11	209
Walleye (Yellow pickerel)	2.361	1.227	19	444	2.861	1.670	15	484
Freshwater drum	1.667	0.759	23	458	1.500	0.875	19	443
Total CUE	230				111			
Number of species	25				24			
Number of nets	36				36			
Total catch	8,281				3,982			

species were captured (Table 2.4.2). The most abundant species by number were Bluegill (1,685), Pumpkinseed (934), Black Crappie (253), Largemouth Bass (156), Brown Bullhead (153), Rock Bass (150), White Perch (135) and Yellow Perch (132). One American Eel was also caught.

Piscivore Biomass

Trophic structure is an indicator of general health of a fish community. A proportion of the fish community assemblage comprised of piscivores greater than 0.20 (biomass) reflects a healthy trophic structure. The proportion of piscivore biomass was 0.26 and 0.40 in the upper and lower Bay of Quinte, respectively (Fig. 2.4.2).

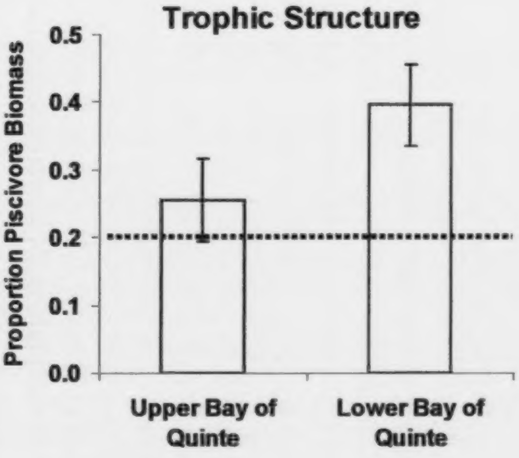

FIG. 2.4.2. Proportion of total fish community biomass represented by piscivore species (PPB) in the nearshore trap net surveys of the upper and lower Bay of Quinte. A PPB>0.20 is indicative of a balanced trophic structure (depicted by a dashed line). Piscivore species included Longnose Gar, Bowfin, Northern Pike, Smallmouth Bass, Largemouth Bass, and Walleye.

Status of Selected Species

Biological (i.e., age distribution, length and weight-at age) information on selected species is presented in Tables 2.4.3-2.4.11. Abundance

TABLE 2.4.3. Age distribution and mean length and weight of 50 **Northern Pike** sampled from NSCIN trap nets in two geographic areas. Ages were interpreted using cleithra.

Age (years)	1	2	3	4	5	6	7	8	9	10
Year-class	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Upper Bay of Quinte										
Number	6	7	9	3	1	1				
Mean fork length (mm)	469	539	577	685	587	650				
Mean weight (g)	796	1088	1470	2280	1606	1178				
Lower Bay of Quinte										
Number	1	13	5	1	1		1	1		
Mean fork length (mm)	453	498	556	668	546		681	815		
Mean weight (g)	559	972	1569	2225	1271		2073	3710		

TABLE 2.4.4. Age distribution and mean length and weight of 55 **Pumpkinseed** sampled from NSCIN trap nets in two geographic areas. Ages were interpreted using scales.

Age (years)	1	2	3	4	5	6	7	8	9	10
Year-class	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Upper Bay of Quinte										
Number		1	5	7	3	9	1	1		
Mean fork length (mm)		115	126	153	160	165	172	173		
Mean weight (g)		35	56	97	105	115	131	135		
Lower Bay of Quinte										
Number	1		2	15	4	6				
Mean fork length (mm)	100		135	157	169	154				
Mean weight (g)	20		66	99	121	107				

TABLE 2.4.5. Age distribution and mean length and weight of 64 **Bluegill** sampled from NSCIN trap nets in two geographic areas. Ages were interpreted using scales.

Age (years)	1	2	3	4	5	6	7	8	9	10
Year-class	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Upper Bay of Quinte										
Number		6	5	4	7	10	1			
Mean fork length (mm)		112	146	154	170	169	160			
Mean weight (g)		31	75	86	116	122	88			
Lower Bay of Quinte										
Number	1		6	7	4	10	2	1		
Mean fork length (mm)	87		158	178	186	175	177	202		
Mean weight (g)	13		105	159	155	135	140	180		

TABLE 2.4.6. Age distribution and mean length and weight of 21 **Smallmouth Bass** sampled from NSCIN trap nets in two geographic areas. Ages were interpreted using scales.

Age (years)	1	2	3	4	5	6	7	8	9	10
Year-class	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Upper Bay of Quinte										
Number	3	2	3	3		2	2	1		
Mean fork length (mm)	204	202	320	371		433	430	465		
Mean weight (g)	161	151	713	1168		1752	1527	1993		
Lower Bay of Quinte										
Number		1				3		1		
Mean fork length (mm)		228				395		448		
Mean weight (g)		216				1354		1992		

TABLE 2.4.7. Age distribution and mean length and weight of 62 **Largemouth Bass** sampled from NSCIN trap nets in two geographic areas. Ages were interpreted using scales.

Age (years)	1	2	3	4	5	6	7	8	9	10
Year-class	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Upper Bay of Quinte										
Number	21	8	1	1						
Mean fork length (mm)	200	264	289	346						
Mean weight (g)	146	340	488	778						
Lower Bay of Quinte										
Number	18	7	1	2	1		1			1
Mean fork length (mm)	196	260	314	319	360		395			431
Mean weight (g)	136	347	625	633	916		1249			1781

trends are presented in Table 2.4.12 and Fig. 2.4.3.

Northern Pike

Northern Pike were of similar abundance and size in the upper and lower Bay of Quinte (Table 2.4.2). Most abundant age-classes were age-1, 2, 3 and 4 in the upper bay and age-2 and 3 in the lower bay (Table 2.4.3). Northern Pike abundance declined from 2003-2009 in the upper bay but increased in 2010 and remained high in 2011 (Table 2.4.12; Fig. 2.4.3).

Pumpkinseed

Pumpkinseed were somewhat more abundant in the upper bay than the lower bay in 2011 (Table

TABLE 2.4.8. Age distribution and mean length and weight of 58 **Black Crappie** sampled from NSCIN trap nets in two geographic areas. Ages were interpreted using scales.

Age (years)	1	2	3	4	5	6	7	8	9	10
Year-class	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Upper Bay of Quinte										
Number	3	4	14	3	3	1	1			
Mean fork length (mm)	164	222	225	265	275	312	313			
Mean weight (g)	81	223	221	362	434	664	685			
Lower Bay of Quinte										
Number	3	14	7	5						
Mean fork length (mm)	157	224	235	271						
Mean weight (g)	67	207	250	379						

TABLE 2.4.9. Age distribution and mean length and weight of 61 **Yellow Perch** sampled from NSCIN trap nets in two geographic areas. Ages were interpreted using scales.

Age (years)	1	2	3	4	5	6	7	8	9	10
Year-class	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Upper Bay of Quinte										
Number		6	9	5	5	3	2			
Mean fork length (mm)		184	173	196	230	237	272			
Mean weight (g)		100	81	115	223	237	333			
Lower Bay of Quinte										
Number			7	9	8	5	1	1		
Mean fork length (mm)			172	190	230	234	236	239		
Mean weight (g)			74	116	184	219	209	201		

TABLE 2.4.10. Age distribution and mean length and weight of 55 **Walleye** sampled from NSCIN trap nets in two geographic areas. Ages were interpreted using scales.

Age (years)	1	2	3	4	5	6	7	8	9	10
Year-class	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Upper Bay of Quinte										
Number	4		8	11	3	3		1		
Mean fork length (mm)	291		403	470	462	527		540		
Mean weight (g)	289		743	1182	1144	1678		1476		
Lower Bay of Quinte										
Number		3	10	5	2			5		
Mean fork length (mm)		352	433	491	515			590		
Mean weight (g)		468	930	1381	1589			2591		

2.4.2). Age-4 and age-6 fish figured prominently in the catch in both upper and lower Bay of Quinte (Table 2.4.4). Abundance trends indicate that Pumpkinseed declined in 2003 and remained stable or increased slightly in the years following (Table 2.4.12; Fig. 2.4.3).

Bluegill

Bluegill were much more abundant in the upper bay than the lower bay (Table 2.4.2). Age-5 fish (2005 year-class dominated the catch in both geographic areas (Table 2.4.5). Bluegill abundance trends show high variability in the upper bay but overall abundance is high. Abundance in the lower bay increased in recent years (Table 2.4.12; Fig. 2.4.3).

Smallmouth Bass

Smallmouth Bass were relatively uncommon in the catches especially in the lower Bay of Quinte (Table 2.4.2). The average size of Smallmouth Bass was much larger than that of Largemouth (Tables 2.4.6 and 2.4.7).

Largemouth Bass

Largemouth Bass were very abundant especially in the upper Bay of Quinte (Table 2.4.2). Their average size was small and age distribution was dominated by age-1 and age-2 fish (Table 2.4.7). Abundance trends indicate that Largemouth Bass abundance was relatively high in 2011 (Table 2.4.12; Fig. 2.4.3).

Black Crappie

Black Crappie very abundant and of relatively large size in both the upper and lower Bay of Quinte (Table 2.4.2). The most abundant age-classes were age-2 and age-3 fish (Table 2.4.8). Black Crappie abundance trends appear relatively stable (Table 2.4.12; Fig. 2.4.3).

Yellow Perch

Yellow Perch were more abundant in the upper Bay of Quinte (Table 2.4.2). Abundance trends indicate that Yellow Perch abundance increased after 2005 and remained high (Table 2.4.12; Fig. 2.4.3).

Walleye

Walleye were slightly more abundant and of larger size in the lower Bay of Quinte (Table 2.4.2). Age-3 and age-4 fish were most common in the catch (Table 2.4.10). Walleye abundance has remained stable in recent years (Table 2.4.12; Fig. 2.4.3).

American Eel

Five American Eel, the first since 2005 (n = 3), were caught in the NSCIN trap nets, four in the upper and one in the lower Bay of Quinte (Table 2.4.11). These are likely stocked eel from recent stocking efforts in the Bay of Quinte (Section 8.3).

TABLE 2.4.11. Biological data for American Eel caught in the 2011 NSCIN program on the upper and lower Bay of Quinte.

Location	Date	Total length (mm)	Weight (g)
Upper Bay of Quinte	13-Sep	603	531
	14-Sep	620	572
	21-Sep	741	1,104
	22-Sep	681	869
Lower Bay of Quinte	07-Sep	720	-

TABLE 2.4.12. Species-specific abundance trends (mean catch per trap net) in the upper and lower Bay of Quinte, 2001-2011. Annual total catch, number of net sets, and number of species are also indicated.

Species	Upper Bay of Quinte 2001	2002	2003	2004	2005	2007	2008	2009	2010	2011	Upper Bay Mean	Lower Bay of Quinte 2002	2003	2004	2005	2009	2011	Lower Bay Mean
Longnose Gar	0.25	0.33	1.14	1.94	0.39	2.92	0.36	0.44	1.56	0.50	0.98	0.61	0.44	0.06	0.22	0.39	0.39	0.35
Bowfin	0.36	0.14	0.58	0.53	0.25	0.92	1.11	0.50	0.81	0.75	0.59	0.50	1.00	0.33	0.31	0.72	1.56	0.74
Gizzard Shad	1.11	1.44	2.00	0.06	20.42	0.39	1.00	0.06	0.64	0.14	2.73	0.28	0.53	0.19	8.42	0.28	0.75	1.74
Brown Trout	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	0.00
Lake Trout	-		-	0.03	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
Lake Whitefish	-		-	-	0.03	-	-	-	-	-	0.00	-	-	-	-	-	-	-
Northern Pike	1.03	0.58	0.86	0.69	0.64	0.44	0.33	0.28	0.83	0.78	0.65	0.83	1.00	0.78	0.97	1.31	0.69	0.93
Mooneye	0.03		-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
Quillback	-		-	-	-	-	-	0.03	-	-	0.00	-	-	-	-	-	-	-
White Sucker	1.03	1.47	1.72	1.25	1.11	0.44	0.92	0.64	0.44	0.42	0.94	3.56	3.92	2.56	2.25	1.83	1.47	2.60
Silver redhorse	-		0.69	0.81	0.28	0.64	0.50	1.44	0.44	0.17	0.55	-	0.08	0.06	-	0.06	0.11	0.05
Shorthead Redhorse	-		0.08	0.47	0.25	0.19	0.33	0.36	0.06	0.19	0.22	-	-	-	0.03	-	-	0.00
Greater Redhorse	-		0.22	0.06	-	-	0.08	0.06	-	0.44	0.10	-	-	-	-	-	-	-
River Redhorse	0.06		0.14	0.17	0.14	0.11	0.44	0.03	-	0.14	0.14	-	-	-	-	-	0.03	0.00
Moxostoma sp.	0.78	0.42	0.08	-	-	-	-	-	-	-	0.13	-	-	-	-	-	-	-
Goldfish	-		-	-	-	-	-	-	-	-	-	0.06	-	-	-	-	-	0.01
Common Carp	0.08	0.11	0.28	0.08	0.11	0.19	0.22	0.19	0.33	0.22	0.18	0.44	0.31	0.22	0.53	0.28	0.33	0.35
Golden Shiner	0.03		0.03	-	0.03	-	0.22	-	0.06	0.14	0.06	0.17	0.03	0.08	0.14	0.28	0.33	0.17
Spottail Shiner	-		-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	-	0.01
Rudd	-		-	-	-	-	-	-	-	-	-	0.06	-	-	-	-	-	0.01
Brown Bullhead	167.67	95.83	37.33	20.83	17.89	7.25	6.42	2.56	10.56	13.69	38.00	71.72	79.00	34.83	21.47	21.89	4.25	38.86
Channel Catfish	2.17	2.17	1.50	1.33	1.72	0.72	0.81	0.28	0.53	0.58	1.18	1.11	1.39	1.19	1.14	0.81	0.39	1.00
American Eel	0.44	0.14	-	0.03	0.06	-	-	-	-	0.11	0.08	0.17	0.17	0.06	0.03	-	0.03	0.07
White Perch	2.19	2.89	7.69	3.67	2.75	4.61	4.31	3.86	1.69	3.75	3.74	0.39	7.50	2.33	0.19	18.58	3.75	5.46
White Bass	0.06	0.14	0.11	0.11	0.19	0.03	0.14	-	-	0.17	0.09	0.06	0.17	0.11	0.22	0.33	0.06	0.16
Rock Bass	0.92	0.67	0.64	0.58	0.50	4.83	3.97	3.89	2.44	4.50	2.29	1.78	4.14	0.94	1.08	2.44	4.17	2.43
Pumpkinseed	89.39	73.08	26.94	15.33	15.97	18.61	18.14	23.42	29.08	37.53	34.75	54.83	20.69	18.33	20.89	25.86	25.94	27.76
Bluegill	169.58	142.64	66.25	75.19	44.44	63.92	159.11	71.75	61.50	136.03	99.04	8.00	7.03	8.31	6.44	57.44	46.81	22.34
Smallmouth Bass	0.94	1.67	0.36	1.64	1.11	0.11	0.92	0.56	0.44	0.47	0.82	0.22	1.06	0.69	0.31	0.14	0.14	0.43
Largemouth Bass	2.47	6.11	7.92	6.08	2.75	4.53	5.39	4.33	4.25	10.39	5.42	5.17	2.56	3.44	1.56	1.92	4.33	3.16
Black Crappie	9.81	15.00	10.22	16.11	8.11	12.92	17.33	10.03	7.53	8.64	11.57	2.33	5.19	4.31	3.31	6.25	7.03	4.74
Yellow Perch	3.75	3.42	1.94	0.83	1.00	4.72	7.00	2.64	6.11	6.25	3.77	2.72	1.39	1.67	1.03	3.36	3.67	2.31
Walleye	3.17	2.47	2.22	2.56	2.14	1.61	2.50	1.75	2.53	2.36	2.33	5.28	8.19	5.61	2.97	3.61	2.86	4.75
Freshwater Drum	6.36	3.31	3.81	2.14	4.36	1.25	1.17	1.89	1.97	1.67	2.79	6.50	7.00	5.28	5.42	6.81	1.50	5.42
Total Catch	464	354	175	153	127	131	233	131	134	230	213	167	153	91	79	155	111	126
Number of Nets	36	36	36	36	36	36	36	36	36	36		36	36	36	36	36	36	
Number of Species	24	21	25	25	25	22	24	23	21	25	**30**	23	22	22	22	22	24	**28**

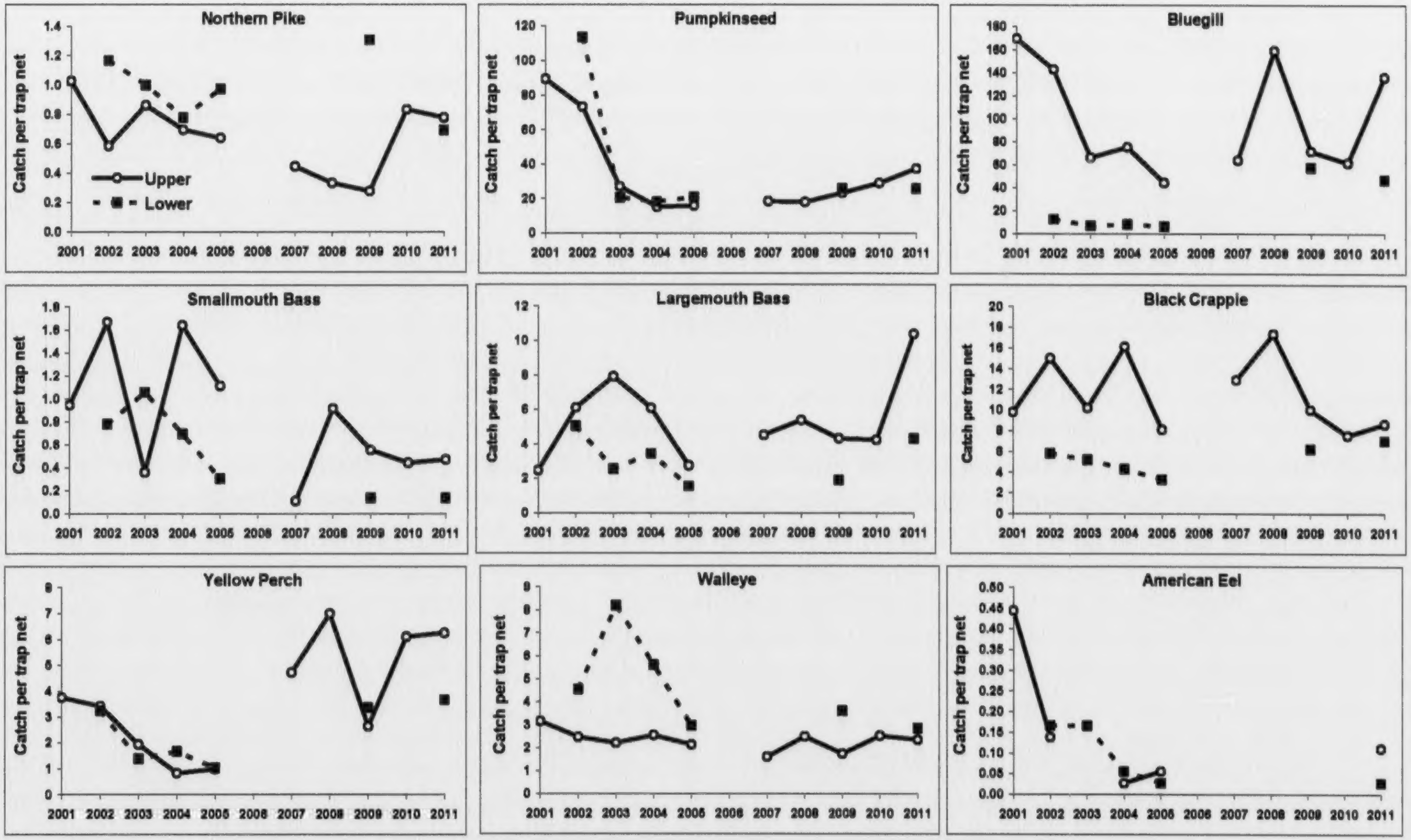

FIG. 2.4.3. Abundance trends for selected species caught in nearshore trap nets the upper and lower Bay of Quinte. Values shown are annual arithmetic means.

2.5 Lake-wide Hydroacoustic Assessment of Prey Fish

The status of prey fish in Lake Ontario is assessed in hydroacoustic surveys conducted jointly since 1991 by Ontario Ministry of Natural Resources (OMNR) and New York State Department of Environmental Conservation (NYSDEC). The surveys are conducted in mid-summer and cover the entire lake. The 2011 survey was conducted during the period of July 25 to Aug 4, and consisted of five north-south shore-to-shore transects in the main lake, and one U-shaped transect in the Kingston Basin. OMNR's new vessel, the Ontario Explorer, was used for the first time, covering the four transects in the central and western portion of the lake, and NYSDECs Seth Green surveyed the two transects in the east (Fig. 2.5.1) Acoustic data used to estimate population densities were collected using a Biosonics 120 kHz split-beam echosounder. No midwater trawls were conducted in 2011 (midwater trawls are normally used to assess the species and size composition of the detected fish).

We encountered problems with excessive noise in the acoustic data collected aboard the Ontario Explorer, and one transect could not be processed. The remaining data were of sufficient quality to derive a population estimate of Alewife, but an estimate for the deeper-dwelling Rainbow Smelt was not feasible (the echosounder amplifies the noise in proportion to depth). We fully anticipate that the noise issue will be resolved in time for the 2012 survey.

The Alewife population estimate for 2011 is 185 million yearling-and-older fish. This is an increase from 2009 (no survey was conducted in 2010), but in line with the general population levels seen since 2003 (Fig. 2.5.2). The 2011 population estimate translates into a biomass estimate of 3929 MT, which is a decrease from 2009. The opposing trends in numbers and biomass are due to influx of young fish into the population (information based on the 2011 USGS/ NYSDEC bottom trawling survey).

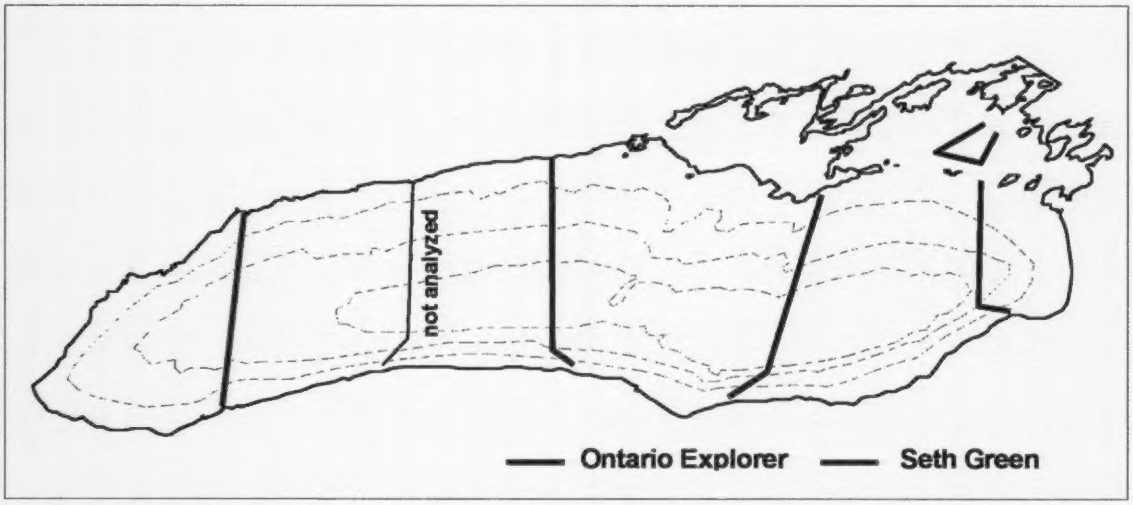

FIG. 2.5.1. Map showing the 2011 hydroacoustic survey. Two transects in the east were surveyed by NYSDEC's vessel Seth Green, the four transects in central and western Lake Ontario were surveyed by OMNR's Ontario Explorer. The data from one transect were not used due to excessive noise.

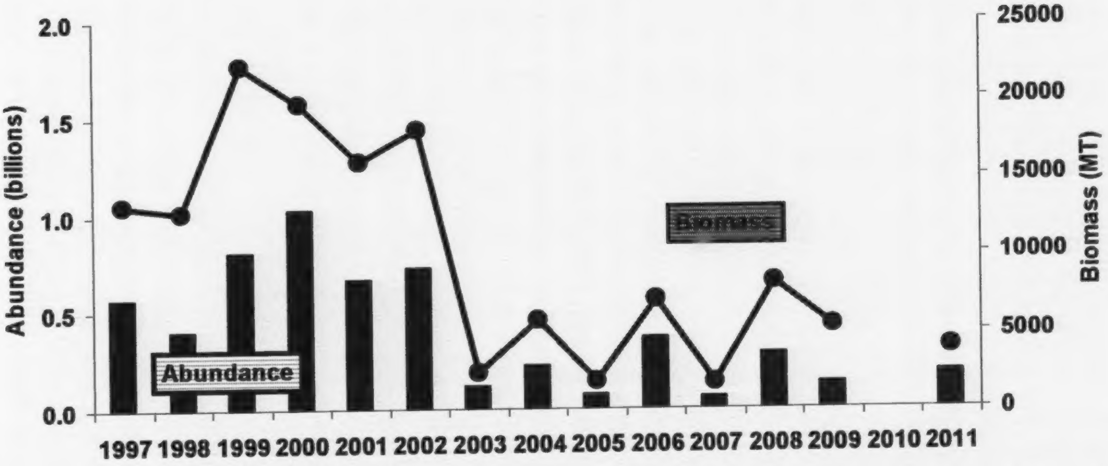

FIG. 2.5.2. Abundance and biomass of yearling-and-older Alewife. Abundance estimates were obtained directly from hydroacoustic surveys, biomass estimates were obtained by applying average weights to abundance estimates. Information on average weights normally comes from midwater trawls done during the surveys, however other sources were used for years 2002, 2004, 2005, 2008 and 2009. The 2011 average weight was obtained from NYSDEC/USGS 2011 bottom trawling survey.

2.6. St. Lawrence River Fish Community Index Netting—Thousand Islands

Every other year in early fall, the Lake Ontario Management Unit conducts an index gillnet survey in the Thousand Islands. The catches are used to estimate abundance, measure biological attributes, and collect materials for age determination, stomach contents and tissues for contaminant analysis and pathological examination. The survey is part of a larger effort to monitor changes in the fish communities in four sections of the St. Lawrence River (Thousand Islands, Middle Corridor, Lake St. Lawrence, and Lake St. Francis), and it is coordinated with the New York State Department of Environmental Conservation (NYSDEC) to provide comprehensive assessment of the river's fisheries resources.

In 2011 the survey was conducted between September 14 and October 1. Forty-eight sets were made, using standard gillnets consisting of 25-foot panels of monofilament meshes ranging from 1.5 to 6 inches in half-inch increments. The average set duration was 21.3 hours (range 19.5-23.7). The overall catch was 2,551 fish comprising 24 species (summary in Table 2.6.1). The average number of fish per set was 53.2 which is the highest in the history of the survey (Fig. 2.6.1), and due mostly to highest-ever catches of Yellow Perch. Other dominant species in the catch were Rock Bass, Smallmouth Bass, and Brown Bullhead (Fig. 2.6.2). Less common species included Northern Pike, Walleye, Channel Catfish, and White Sucker, while the remaining

TABLE 2.6.1. Catches per standard gillnet set in the **Thousand Islands** area of the St. Lawrence River, 1987-2011. Catches from multifilament nets (all catches prior to 2001, and a portion of catches in 2001-2005) were adjusted by a factor of 1.58 to monofilament netting standards initiated in 2001.

	1987	1989	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
Lake Sturgeon	-	-	-	-	-	-	0.03	-	0.02	0.02	0.02	0.04	0.04
Longnose gar	-	-	0.03	-	-	0.03	-	-	0.07	0.04	-	0.04	0.04
Bowfin	0.08	0.13	-	0.06	0.03	0.07	-	0.02	0.07	0.05	0.08	0.06	0.13
Alewife	0.49	-	0.09	0.03	0.03	-	-	-	-	0.02	0.13	0.06	-
Gizzard shad	-	0.41	0.46	-	-	-	0.03	0.06	-	0.04	0.02	-	0.08
Chinook salmon	-	-	0.03	-	-	-	0.03	0.02	-	-	-	-	0.02
Brown trout	-	0.05	-	-	-	-	-	-	-	-	-	-	0.04
Rainbow trout	-	-	-	-	-	0.03	-	-	-	-	-	-	-
Lake trout	-	0.13	-	0.16	0.13	0.13	-	-	-	-	-	-	-
Lake herring	-	-	-	-	0.06	-	-	-	-	-	-	-	-
Northern pike	4.46	6.73	4.35	3.62	2.61	2.40	2.14	1.33	2.05	1.78	1.25	0.88	1.15
Muskellunge	-	-	0.03	-	-	-	-	0.02	0.04	-	-	-	-
Esocidae hybrids	-	-	-	-	0.03	-	-	-	-	-	-	-	-
Chain pickerel	-	-	-	-	-	-	-	-	-	-	-	0.02	-
Mooneye	0.05	-	-	-	-	-	-	-	-	-	-	-	-
White sucker	1.09	2.10	1.39	1.49	1.37	1.25	1.78	0.75	0.93	0.64	0.38	0.23	0.58
Moxostoma sp.	-	0.08	0.06	0.13	0.33	-	0.23	0.08	0.11	0.10	0.06	0.02	0.10
Common carp	0.05	0.13	0.09	0.03	0.09	0.36	0.13	0.08	0.12	0.04	0.02	-	0.04
Chub	-	0.05	-	-	-	-	-	-	-	0.02	-	-	-
Golden shiner	0.05	0.05	-	0.06	0.03	-	0.03	-	-	0.04	0.06	0.31	0.13
Brown bullhead	2.56	1.79	2.46	1.06	0.95	1.91	3.85	3.00	2.66	4.69	1.13	3.58	1.67
Channel catfish	0.81	0.08	0.55	0.16	0.30	0.30	0.56	0.25	0.35	0.20	0.67	0.54	0.63
White perch	0.08	-	0.36	0.03	0.06	-	0.07	0.10	0.02	0.15	-	-	-
White bass	0.05	0.60	0.43	0.24	-	0.07	-	-	-	-	-	-	0.29
Rock bass	4.14	4.46	5.44	4.77	5.56	4.87	7.54	9.48	7.23	7.28	10.77	7.00	7.54
Pumpkinseed	4.61	6.19	5.81	3.89	2.80	2.40	3.23	1.40	1.21	0.67	0.63	0.44	0.35
Smallmouth bass	3.16	5.67	4.31	2.34	1.55	1.48	3.19	1.67	3.97	7.59	5.06	3.79	3.54
Bluegill	0.65	0.88	0.43	0.06	-	0.16	0.07	0.02	0.14	0.10	0.02	0.08	0.06
Largemouth bass	0.13	0.36	0.13	0.16	0.16	0.03	0.23	0.08	0.22	0.33	0.63	0.27	0.40
Black crappie	0.13	0.16	0.09	0.06	0.03	0.03	0.10	0.06	0.07	0.16	0.06	0.04	0.13
Yellow perch	27.79	17.62	15.41	16.23	22.67	21.33	22.22	18.06	20.32	14.26	28.65	20.88	35.27
Walleye	0.21	0.60	0.33	0.33	0.27	0.59	0.07	0.19	0.23	0.23	0.60	0.60	0.77
Round goby	-	-	-	-	-	-	-	-	-	0.77	0.19	0.19	0.02
Freshwater drum	-	-	0.09	-	0.03	0.10	-	0.06	0.04	0.30	0.04	0.21	0.13
Total Catch	50.56	48.25	42.39	34.90	39.11	37.56	45.49	36.75	39.87	39.54	50.46	39.29	53.15

species each comprised less than 1% of the catch.

Species Highlights

Yellow Perch started increasing in abundance in most areas of the St. Lawrence River in the middle of the past decade. In the 2011, Thousand Islands survey catches of Yellow Perch were the highest ever, nearly double the average level over the 1987-2005 period (Fig. 2.6.3).

The centrarchids are represented by six species in the upper St. Lawrence: Rock Bass, Pumpkinseed, Bluegill, Smallmouth Bass, Largemouth Bass and Black Crappie (Figs, 2.6.4 and 2.6.5). Rock Bass are the most abundant, maintaining high abundances over the past decade, Smallmouth Bass have declined somewhat from recent high levels, and Pumpkinseed are at a low level after a steady decline spanning the entire survey period. Bluegill, Largemouth Bass and Black Crappie were historically at much lower levels than the former three species, and remain so, although Largemouth Bass had a moderate increase over the last decade.

Northern Pike remain at very low level, reached after a slow steady decline spanning almost the entire history of the Thousand Islands survey (Fig. 2.6.6). The current abundance is roughly one fifth of the abundance observed in the late 1980s.

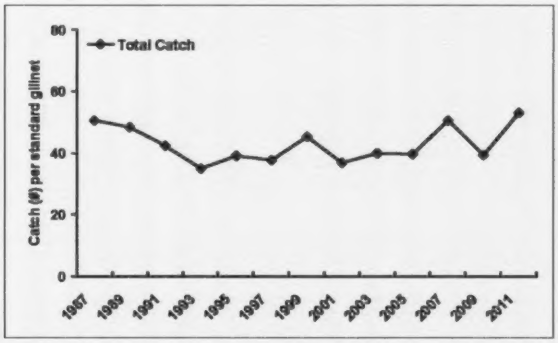

FIG. 2.6.1. Total number of fish (**all species**) per standard gillnet set in the Thousand Islands area of the St. Lawrence River, 1987-2011.

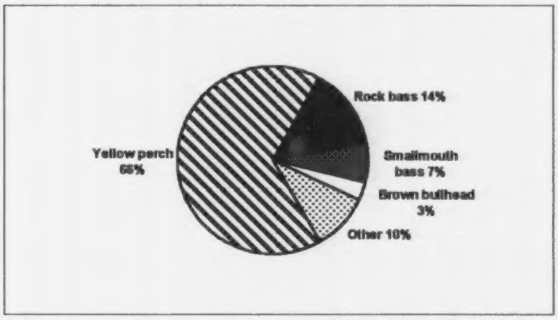

FIG. 2.6.2. Species composition in the 2011 gillnet survey in the Thousand Island area of the St. Lawrence River.

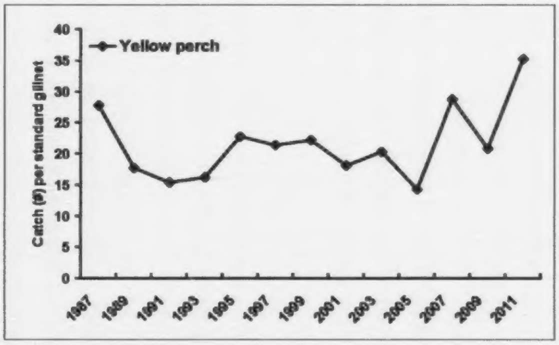

FIG. 2.6.3. **Yellow Perch** catch per standard gillnet set in the Thousand Islands area of the St. Lawrence River, 1987-2011.

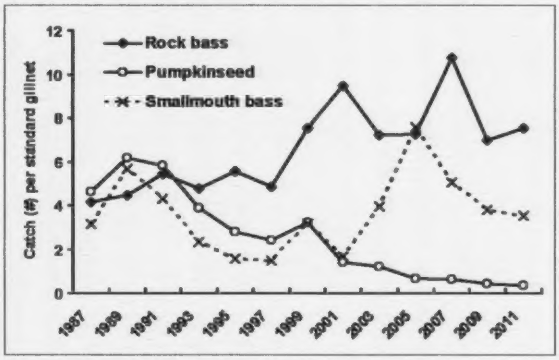

FIG. 2.6.4. **Centrarchid** catches per standard gillnet set in the Thousand Islands area of the St. Lawrence River, 1987-2011.

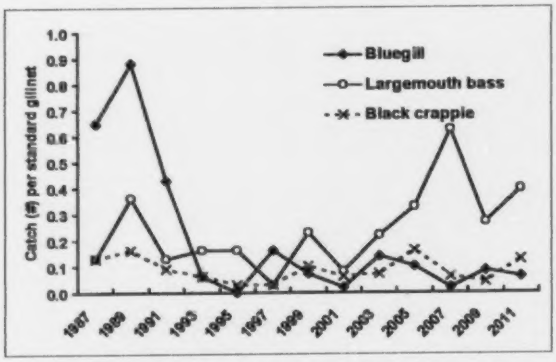

FIG. 2.6.5. **Centrarchid** catches per standard gillnet set in the Thousand Islands area of the St. Lawrence River, 1987-2011.

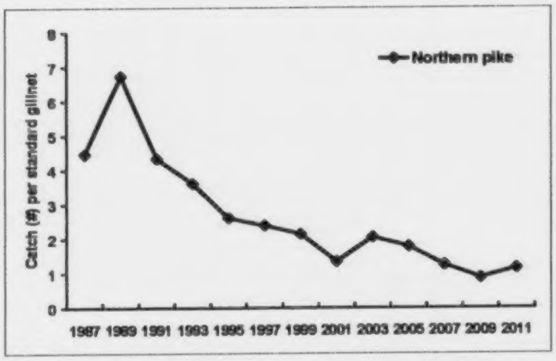

FIG. 2.6.6. **Northern Pike** catch per standard gillnet set in the Thousand Islands area of the St. Lawrence River, 1987-2009.

2.7 Credit River Chinook Assessment

Growth, condition, and lamprey marking of Chinook Salmon were monitored during the fall spawning run at the beginning of October in the Credit River at the Kraft dam in Streetsville. Chinook Salmon were electrofished in the Credit River for spawn collection by the Normandale Fish Culture Station with the help of volunteers. LOMU staff measured the fork length, weighed, and collected otoliths for ageing from 84 of these fish. In the past this sample has been selective towards larger fish, and so, to obtain a more representative length sample of the spawning run, 150 fish were measured prior to sorting for spawn collection and detailed sampling. Chinook Salmon were aged by counting annuli on thin sectioned otoliths. Length-at-age was calculated as a weighted mean based on the unsorted sample. The body condition was estimated for each sex as the weight of a 900 mm fish based on a general linear model.

Unusually, the length of Chinook Salmon in the Credit River in 2011 increased while the condition (weight of a 900-mm fish) decreased compared with 2010. The length of age-2 and age-3 Chinook Salmon (sexes combined) was about 2% above the mean for 1991-2010 (Fig. 2.7.1). The length of age-2 males (816 mm) and females (809 mm), and age-3 females (912 mm) increased from the previous year, but the length of age-3 males (916 mm) decreased slightly (Fig. 2.7.1). The condition of Chinook Salmon in the Credit River in 2011 was among the lowest values observed since 1989 (Fig. 2.7.2). The condition of both male and female Chinook Salmon in 2011 decreased significantly ($P > 0.05$) compared with 2010. The condition of females in 2011 was not significantly different ($P < 0.05$) than in 2004-2008, and the condition of the males was not significantly different from 2001 and 2003-2009.

Most of the intensively sampled Chinook Salmon were age 1-3 years and all had an adipose clip indicating very little natural reproduction in the Credit River during 2008-2010. One age-4 Chinook salmon was observed with an adipose fin clip, indicating it had been stocked in 2007 as part of a pen-rearing project at Barcovan or Wellington by the Central Lake Ontario Sport Anglers.

Almost all Chinook Salmon had no lamprey marks. One fish of 84 examined had one A4 mark.

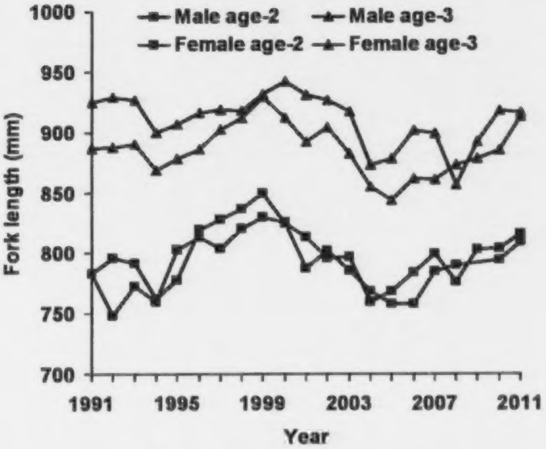

FIG. 2.7.1. Fork length of age-2 and age-3 Chinook Salmon by sex during the spawning run in the Credit River, 1991-2011.

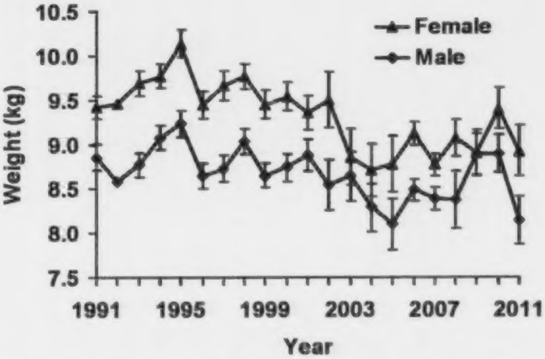

FIG. 2.7.2. Mean weight (+ 95%) of a 900 mm (35.4 inch) Chinook Salmon during the spawning run in the Credit River, 1991-2011.

2.8 Juvenile Atlantic Salmon Parr Survey

In 2011, Atlantic Salmon spring fingerlings (~1 g) were stocked in the Credit River and its tributaries (see Section 2.10, Fig. 2.10.1) to restore self-sustaining populations (Section 7). The purpose of this survey was to evaluate growth and survival of Atlantic Salmon parr stocked as spring fingerlings, and in conjunction with smolt surveys (Section 2.9), to evaluate the relative contribution of each reach to the smolt migration. Atlantic salmon populations were surveyed at 7 reaches (Table 2.8.1).

Atlantic Salmon parr were captured by electrofishing and marked in October 2011, after most of the year's growth was complete, and when fish size (> 100 mm) indicates potential smolting. Marking and recapture sessions were about one week apart. Other species were released upon capture, and were not generally recorded. Parr were marked (N = 3,666) using yellow, purple, or red Visible Implant Elastomer (VIE) marks placed behind an eye or under the jaw according to stream reach and age group (Table 2.8.2). During recapture sessions parr were marked for smolt assessment. Population estimates are not presented here.

Atlantic Salmon parr exhibited two distinct growth patterns in the Credit River (Table 2.8.3). Parr were smaller at Black Creek (86.0-89.9 mm mean fork length), and most were less than 100 mm, and accordingly, are not expected to smolt in 2012. At the remaining reaches in the West Credit and main branch of the Credit most parr were larger (106.2-117.1 mm mean fork length) than 100 mm and are expected to smolt in 2011. Mean fork length was 7-21% greater in 2011 compared with 2010. The greatest increase was in the West Credit, which, in 2010, was found to be a slower growth reach similar to Black Creek. The reason for these increases in growth is unclear.

TABLE 2.8.1. Geo-coordinates (downstream end) and dimensions electrofishing sample in 2011.

Reach	Latitude	Longitude	Sample length (m)	Stream width (m)
Meadow (Forks Prov. Park)	43° 48.79	80° 00.93	386	8.1
Stuck truck (Forks Prov. Park)	43° 48.68	80° 00.38	322	9.9
Brimstone (Forks Prov. Park)	43° 48.15	79° 59.76	467	12.1
Ellies (Forks o' Credit Rd.)	43° 48.29	79° 59.48	263	15.7
West Credit Belfountain C.A.	43° 47.82	80° 00.41	377	9.8
Black Creek 6th Line	43° 37.79	79° 56.88	528	6.7
Black Creek 15 Side Rd	43° 37.46	79° 55.53	226	6.0

TABLE 2.8.3. Fork length (mm) of Atlantic Salmon by location and age group in 2011.

Reach	Age 0	Age 1 and older
Meadow (Forks Prov. Park)	117.1	165.1
Stuck truck (Forks Prov. Park)	110.7	157.9
Brimstone (Forks Prov. Park)	107.8	154.0
Ellies (Forks o' Credit Rd.)	114.7	153.9
West Credit Belfountain C.A.	106.2	146.4
Black Creek 6th Line	89.9	137.3
Black Creek 15 Side Rd	86.0	131.9

TABLE 2.8.2. Number of Atlantic Salmon marked and VIE colour and location by age group in 2011.

Reach	Age 0			Age 1 and older			Total number
	Number	Colour	Location	Number	Colour	Location	
Meadow (Forks Prov. Park)	265	Purple	Left jaw	16	Purple	Left eye	281
Stuck truck (Forks Prov. Park)	631	Red	Left eye	28	Yellow	Left eye	659
Brimstone (Forks Prov. Park)	146	Red	Left jaw	12	Yellow	Left jaw	158
Brimstone (Forks Prov. Park)	319	Red	Right jaw	37	Yellow	Right jaw	356
Ellies (Forks o' Credit Rd.)	448	Red	Left jaw	36	Yellow	Left jaw	484
West Credit Belfountain C.A.	433	Red	Right eye	65	Yellow	Right eye	498
Black Creek 6th Line	622	Purple	Right jaw	45	Purple	Right eye	667
Black Creek 15 Side Rd	520	Purple	Right jaw	43	Purple	Right eye	563
Total	3,384			282			3,666

2.9 Credit River Atlantic Salmon Smolt Survey

Monitoring Atlantic salmon throughout their life cycle is critical to the success of the Lake Ontario Atlantic Salmon Restoration Program. This information is necessary to choose 'best' management strategies in the future. Collecting information while salmon are out-migrating to Lake Ontario is a critical fisheries reference point, because it represents the outcome of stream life and allows biologists to compare stream and lake survival.

In 2011, biological data (e.g., length, weight, condition) and population data (e.g., age-class, abundance, run-timing) on Atlantic salmon out-migrants were collected on the Credit River at the Meadowvale Conservation Area using a Rotary Screw Trap (Fig. 2.9.1; see also Section 2.10, Fig. 2.10.1).

Some of the goals of the Credit River Atlantic Salmon smolt survey are to:

- refine protocol—test the utility of Rotary Screw Traps for Smolt Assessment;
- gain insight into life history attributes (timing and patterns of smolt out-migration, size, age) within the Credit River of the three stocked strains (LeHave, Sebago, and Lac St. Jean);
- determine relative success of stocking strategies (fry vs. fall fingerling vs. pre-smolt);
- detect natural production;
- help identify bottlenecks in species production (stream vs. lake survival); and
- provide means of detecting changes through time.

Ideally sampling would commence before the beginning of out-migration and traps would be operated 24 hours per day, 7 days per week, with daily monitoring until catches dissipate. However, 2011 was a trial year needed to refine operations. The trap was installed on April 7 and removed on June 17th and fished for 51 days.

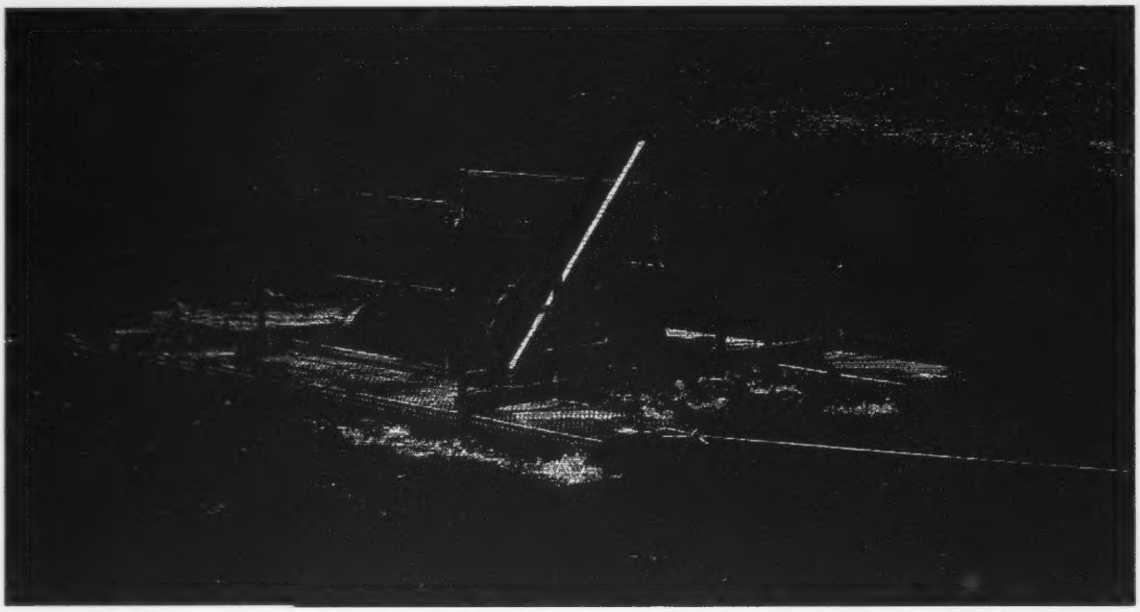

FIG. 2.9.1. Rotary Screw Trap at the Meadowvale Conservation Area on the Credit River.

Collections

All species collected in the trap were recorded. Lengths and weights were recorded for all Atlantic Salmon and Rainbow Trout while lengths and weights were only recorded on a sub-sample of Chinook Salmon due to their high abundance following stocking at upstream locations. Lengths and weights were also recorded on all Sea Lamprey collected and the data provided to Sea Lamprey Control—Fisheries and Oceans Canada. Almost 3,000 fish were collected over the 51 sampling days representing 26 species (see Table 2.9.1).

Salmonid Catches

To help characterize the out-migration period of Atlantic Salmon and other salmonids, river discharge and water temperature data was collected (Fig. 2.9.2). River discharge data was obtained online from the Water Survey of Canada website. The gauge station used is located upstream at Norval Ontario. Water temperature data was collected on site with on-site temperature probes. Catches of salmonids began on the first day following trap installation and likely indicate that the trap was installed late and that portions of the out migration were missed. Catches remained relatively low until late April when catches of rainbow trout spiked on April 27th. This period from Late April to mid May represent the peak of out-migration for all salmonids encountered but it is important to note that the period proceeding and following coincided with times the trap was either not fishing or fishing sub-optimally. Continued collection of out-migrating fish across varying flow and temperature regimes should help extrapolate catches to periods when trap operation is likely hampered by high flows and debris loads. The last capture date for Atlantic salmon was June 7th while both rainbow trout and Chinook salmon were taken on or just proceeding the date of trap removal (June 17th). Water temperatures during mid June were reaching highs in excess of 25 °C.

TABLE. 2.9.1. List of species collected using Rotary Screw Trap.

Species	Number caught
Chinook Salmon	1,129
Common Shiner	505
Rainbow Trout	338
Longnose Dace	301
Atlantic Salmon	246
Pumpkinseed	140
Sea Lamprey	56
Rainbow Darter	52
White Sucker	35
Blacknose Dace	34
Golden Shiner	33
Fathead Minnow	22
Stonecat	22
Creek Chub	19
Hornyhead Chub	17
Brown Trout	12
Brook Stickleback	9
Northern Hog Sucker	7
Largemouth Bass	4
Fantail Darter	3
Central Mudminnow	2
Rock Bass	2
Johnny Darter	2
Northern Redbelly Dace	1
Emerald Shiner	1
Bluntnose Minnow	1
Total catch	2,993

Composition of the salmonid catch

Fork lengths of captured salmonids ranged from 72 mm to 216 mm for Atlantic Salmon, 58 mm to 288 mm for Rainbow Trout, and from 63 mm to 144 mm for Chinook Salmon. For the most part the mean size of salmonids tended to increase as the trapping season progressed (see Table 2.9.2.).

All stocked Atlantic Salmon are genetically tagged so that the relative contribution of the three stocked strains (i.e., LeHave, Sebago, and Lac St. Jean) and three life stages stocked (i.e., spring fingerling, fall fingerling, and spring yearling) can be assessed. Tissues were collected on all Atlantic Salmon captured for processing at the Trent University Fisheries Genetics Lab. Genetic analysis is still ongoing so this aspect of the assessment program cannot be reported.

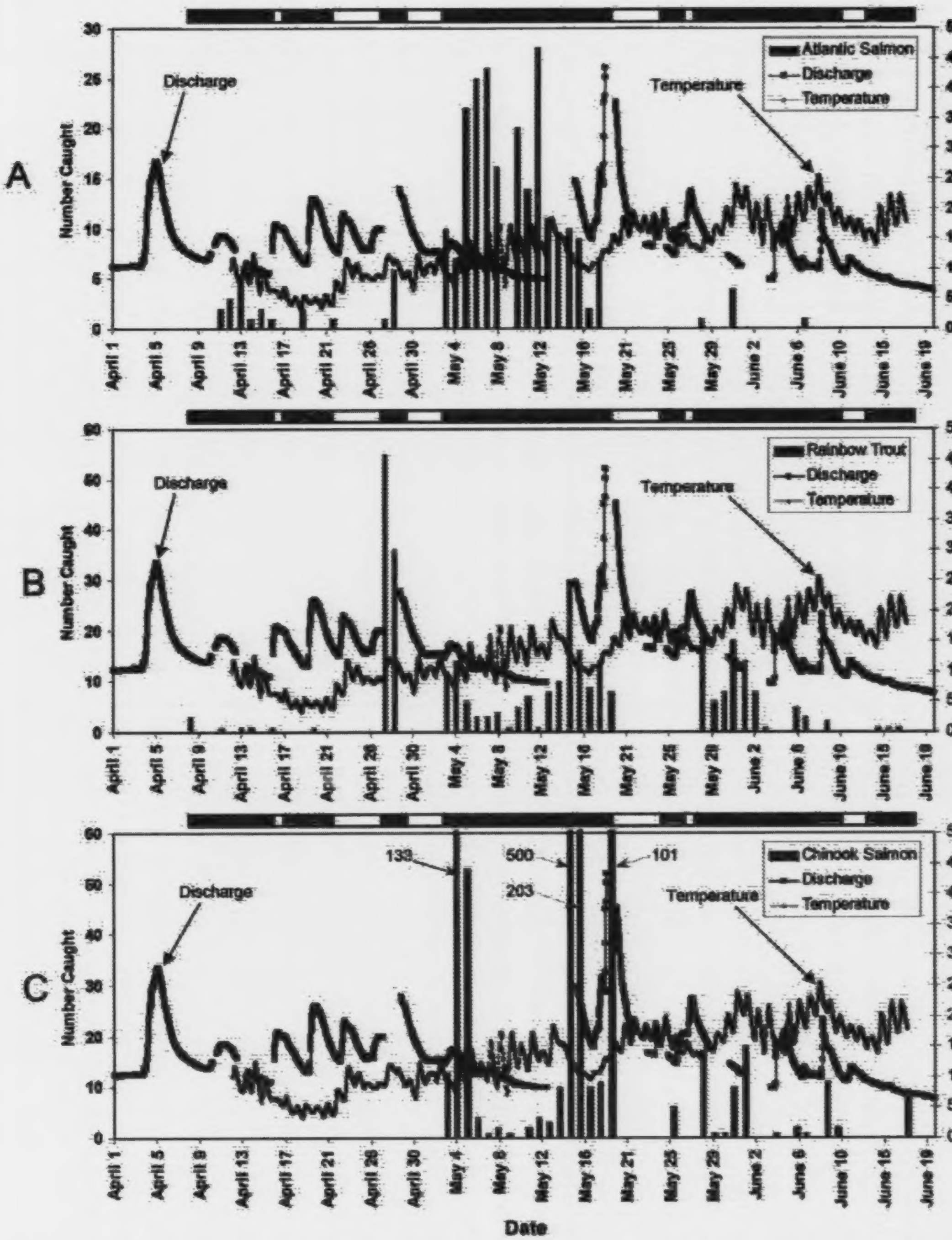

FIG. 2.9.2. Timing of catches of A) Atlantic Salmon, B) Rainbow Trout, and C) Chinook Salmon presented against discharge and water temperature profiles*. Note Trap activity line at the top of each graph. Black denotes times when trap was fishing well, grey indicates days where operation was sub-optimal, and white indicates periods when the trap was not fishing. Y-axes have the same scale for visual comparison. Catches of Chinook salmon beyond the scale indicated on figure.

**Discharge data collected upstream of trap at Norval by Water Survey of Canada gauge (data incomplete). Water temperature collected on site with onsite temperature probes.*

All Rainbow Trout were examined for marks (fin clips or obvious signs of fin wear) to determine contributions of hatchery and wild production. Fifty-two percent of the rainbow trout captured were presumed to be of wild origin due to the lack of any marks attributed to hatchery influence. The remainder either had hatchery fin clips or showed obvious fin wear as common artefact of hatchery rearing. The out-migration of these two groups proved interesting. Not only were the wild smolts larger on average (Table 2.9.2) but they tended to migrate later than the early pulse of Rainbow Trout which were largely composed of hatchery derived individuals (see Fig. 2.9.3).

All Chinook salmon were of hatchery origin.

Population Estimates

Portions of the Atlantic Salmon and Rainbow Trout catch were marked and released upstream to conduct stratified mark-recapture estimates. However, due to long periods of trap inactivity at critical out-migration periods the population size of out–migrants are likely underestimated. Efforts to improve sampling consistency (e.g., more crew members) along with attempts to address mark-recapture assumption violations are underway.

TABLE 2.9.2. Fork length statistics for captured salmonids throughout sampling period. Daily data combined into weekly capture strata. Rainbow Trout length statistics also presented for hatchery and wild strains.

Week of	Atlantic Salmon					Rainbow Trout					Chinook Salmon				
Capture	Count	Mean	Min	Max	sd	Count	Mean	Min	Max	sd	Count	Mean	Min	Max	sd
Week 1	14	131.0	74	175	34.4	6	105.2	58	193	49.2	-				
Week 2	3	113.7	72	143	37.1	1	176.0	176	176		-				
Week 3	7	133.4	114	144	10.2	91	103.3	78	155	18.1	-				
Week 4	106	161.5	95	210	22.8	42	142.2	80	210	34.3	37	75.1	63	86	4.82
Week 5	92	164.5	127	216	17.4	61	176.1	97	288	27.5	40	81.4	69	90	4.49
Week 6	17	165.1	139	204	13.9	47	170.8	101	247	23.6	39	84.8	74	93	4.43
Week 7	1	140.0	140	140		26	174.8	152	227	16.3	17	91.2	83	103	4.63
Week 8	4	138.8	131	148	7.4	49	159.2	102	194	22.7	22	97.4	89	110	5.94
Week 9	1	128.0	128	128		9	159.2	130	191	20.1	15	106.9	95	144	11.40
Week 10	-					3	133.0	100	157	29.5	8	90.8	79	108	8.91
Wild						173	166.9	58	288	29.0					
Hatchery						159	124.1	78	195	34.7					

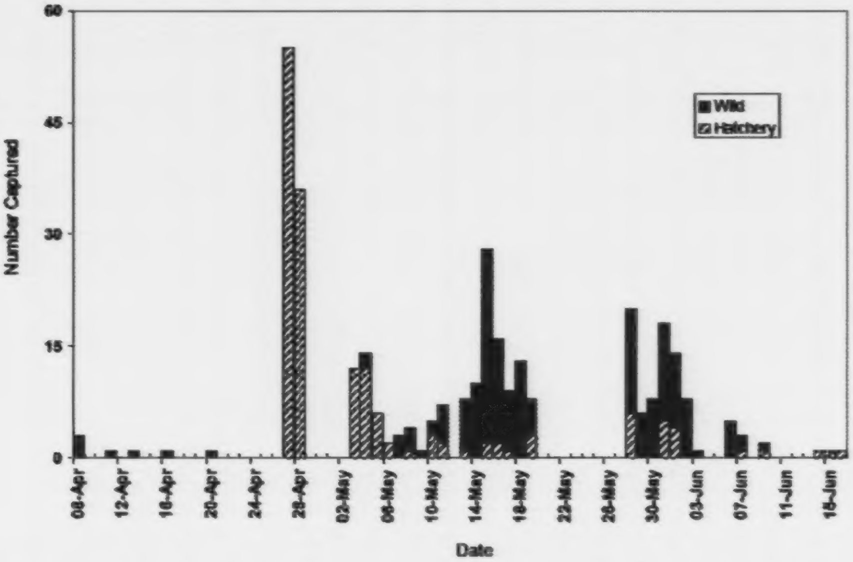

FIG. 2.9.3. Number of hatchery derived and assumed wild **Rainbow Trout** captured through the trapping period.

2.10 Credit River Fishway Atlantic Salmon Assessment

Management efforts are underway to restore Atlantic Salmon to Lake Ontario (Section 8.2). After Atlantic Salmon smolts out-migrate to the lake they spend at least a year, and likely several more, feeding and growing until they mature and return to the Credit River to spawn. Fishways at Streetsville and Norval (Fig. 2.10.1) allow for the passage of fish around barriers to gain access to quality spawning habitat and provide an opportunity to count and sample returning adults.

The dam at Streetsville is the first barrier adult Atlantic Salmon face moving upstream on the Credit River from Lake Ontario. A step-pool design fishway was constructed at this dam in 1981. This fishway is in place to provide selective passage for salmonids. However, a screen can be placed at the top of the fishway to

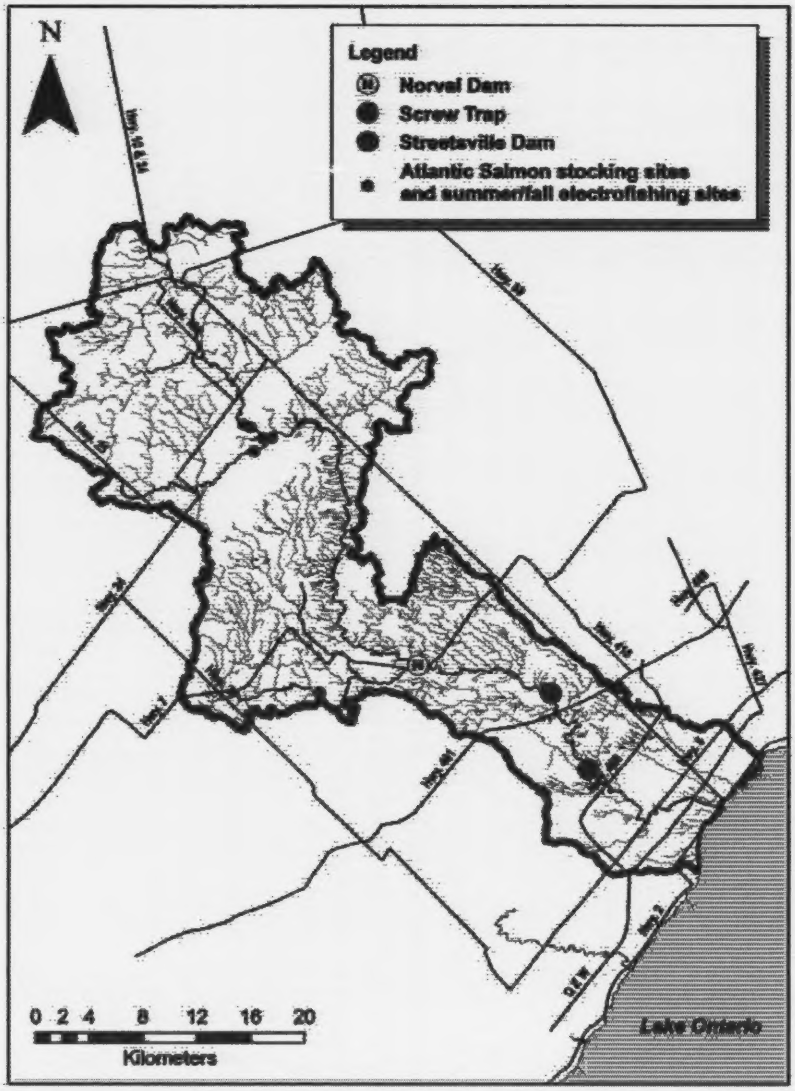
N
Legend
Norval Dam
Screw Trap
Streetsville Dam
Atlantic Salmon stocking sites and summer/fall electrofishing sites
Hwy. 410
Hwy. 401
Hwy. 7
Hwy. 2
Q.E.W.
Lake Ontario
0 2 4 8 12 16 20
Kilometers

FIG. 2.10.1. Map of the Credit River, Lake Ontario showing locations of the fishways at Noval and Streetsville Dams, the smolt screw trap site (Section 2.9), and general stocking locations and electrofishing sites (Section 2.8).

stop fish from passing through, thereby providing an opportunity to monitor adults in the step pools and the channel below.

Continuing upstream from the dam at Streetsville, the next major obstacle to fish movement is the dam at Norval. A Denil fishway was reconstructed in 2011 to facilitate fish movement past this dam. A cage lowered into the fishway structure enables monitoring of adult Atlantic Salmon, and other species, as they move upstream. 2011 was the first year of operation of the fishway at Norval.

Assessment of adult Atlantic Salmon moving up the Credit River through the two fishways took place from August 23 through November 25, 2011. Monitoring of the fishway at Streetsville took place on most weekdays (and occasionally on weekends) from September 8 through November 20. The fishway was monitored on 48 occasions during that time. Along with other species (Table 2.10.1), 21 adult Atlantic Salmon were captured in the fishway. Due to the step-pool design, only jumping fish were present in the fishway.

The fishway at Norval was operated on most weekdays from August 23 until November 25. During that period, the fishway was operated on 58 occasions. Along with other species (Table 2.10.2), eight adult Atlantic Salmon were captured in the fishway; two of these fish were previously caught at Streetsville, suggesting that some Atlantic Salmon passed through the fishway at Streetsville before August 23.

A total of 39 individual adult Atlantic Salmon were caught in the Credit River at Streetsville and Norval. Only two of the fish caught at Streetsville were recaptured at Norval. Three additional Atlantic Salmon were caught during Credit Valley Conservation and Ontario Ministry of Natural Resources electrofishing events in August and October, two at Forks of the Credit Provincial Park and one below the dam at Belfountain. Twenty-nine Atlantic Salmon were caught in fishways (representing 27 individuals, 2 recaptures), five were netted in the fishway channel at Streetsville and nine were electrofished (e.g. during Chinook Salmon egg collection and fish community monitoring surveys). A tissue sample was removed from all sampled Atlantic Salmon and will be processed for genetic information to determine their origin.

TABLE 2.10.1. Numbers of fish caught by species (including recaptures) from fishway at Streetsville in 2011.

Species	Number Caught
Atlantic Salmon	33
Chinook Salmon	3,203
Coho Salmon	181
Rainbow Trout	249
Brown Trout	28
Tiger Trout	1
Longnose Gar	1

TABLE 2.10.2. Numbers of fish caught by species (includes recaptures) from the fishway at Norval in 2011.

Species	Life Stage	Number Caught
Atlantic Salmon	*adult*	8
	juvenile	5
Chinook Salmon	*adult*	4
	juvenile	0
Coho Salmon	*adult*	3
	juvenile	41
Rainbow Trout	*adult*	7
	juvenile	212
Brown Trout	*adult*	2
	juvenile	1
Common Shiner		2,463
Longnose Dace		12
Blacknose Dace		13
Northern Hogsucker		84
White Sucker		8
American Eel		1
River Chub		62
Creek Chub		16
Bluntnose Minnow		3
Fathead Minnow		2
Pumpkinseed		7
Smallmouth Bass	*YOY*	3

3. Recreational Fishing Surveys

3.1 Western Lake Ontario Boat Angling Fishery

The angling fishery for salmon and trout in western Lake Ontario started with the stocking of Coho Salmon by New York State and Ontario in the late 1960s. Other salmon and trout species have been added to the stocking mix (Section 7), and natural reproduction has increased as well. Currently, boat anglers catch Chinook Salmon, Rainbow Trout, Coho Salmon, Atlantic Salmon, Brown Trout, and Lake Trout. OMNR has surveyed this fishery in most years since 1977, and we have relied on it as an index of relative abundance of salmon and trout populations since 1982. This survey provides the primary biological monitoring of salmon and trout in the Ontario waters of Lake Ontario, and the only statistics for this fishery. In particular, this survey provided a broad geographic and seasonal array of biological samples, and is our best source of Chinook Salmon fin clips and coded wire tags for the mass marking study (Section 3.2).

Anglers fishing from boats were monitored at marinas and ramps during April to August from the Niagara River to Wellington (Fig 3.1.1). The survey was stratified by month and spatially by six sectors. Anglers were interviewed at selected high-effort ramps and marinas after fishing was completed. Some low effort strata were not sampled and we estimated catch and effort in these strata based on samples from other years. The survey design was similar to the last combined ramp and marina survey conducted in 1995. Previously, we extrapolated estimates of the 1995 marina fishery to provide estimates of later marina fishery surveys based on ramp surveys. We have recalculated our estimates of marina fisheries between 1995 and 2011 by using both marina surveys.

Angling statistics for the salmon and trout fishery in the Ontario waters of Lake Ontario for 1977 to 2011 are provided in Table 3.1.1. A regulation change allowing two rods per angler (previously one rod per angler) in Lake Ontario came into effect during summer 1998. Therefore, for the years 1998-2011, fishing effort is reported as both angler hours and rod hours. The percentage of anglers using two rods increased gradually after 1998, and appears to have levelled-off at about 50% (Fig. 3.1.2).

Angling effort during the 2011 boat angler fishery was 443,548 rod-hrs (Table 3.1.1). Effort has not varied greatly since 2001 (Fig. 3.1.3). Chinook Salmon dominated the catch (39,172) followed by Rainbow Trout (25,588). Together, the two species represented about 86% of the catch, but their dominance declined from 95% in 2005 due especially to increased catches of Coho Salmon, and Brown Trout.

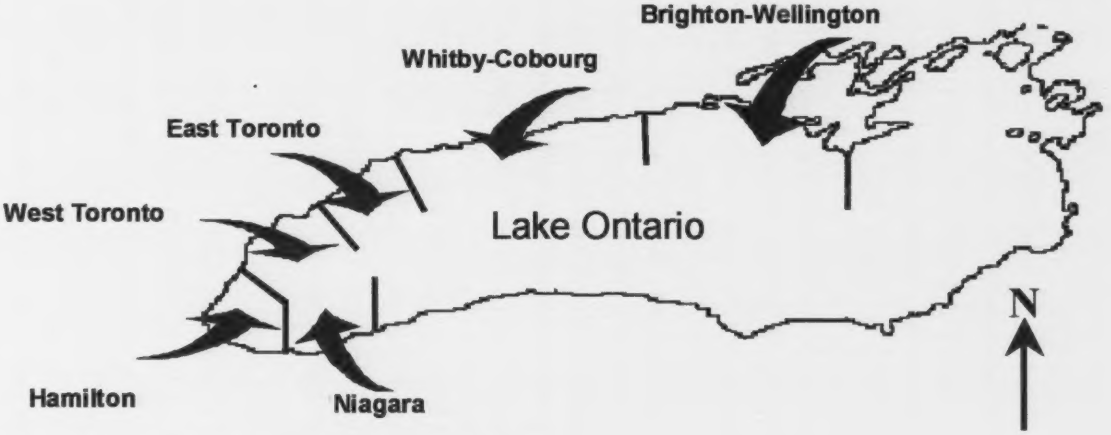

FIG. 3.1.1. Spatial stratification of OMNR angler surveys in Lake Ontario.

TABLE 3.1.1. Angling statistics for the salmon and trout fishery in the Ontario waters of Lake Ontario (excluding Kingston Basin), 1977 to 2011.

	Catch						Harvest						Effort	
Year	Chinook Salmon	Rainbow Trout	Coho Salmon	Atlantic Salmon	Brown Trout	Lake Trout	Chinook Salmon	Rainbow Trout	Coho Salmon	Atlantic Salmon	Brown Trout	Lake Trout	Rod-hr	Angler-hr
1977	4,047	N/A	72,718	-	N/A	N/A	3,972	N/A	72,586	-	N/A	N/A	465,137	
1978	1,928	2,109	97,924	-	450	72	1,892	2,096	97,746	-	450	72	418,895	
1980	1,774	5,769	79,326	-	86	317	1,774	5,756	79,129	-	86	273	656,086	
1982	2,730	5,435	74,854	-	129	1,512	2,447	4,126	66,998	-	129	1,172	744,802	
1983	23,303	21,774	16,049	-	1,566	4,627	17,083	17,190	13,546	-	1,190	3,537	534,473	
1984	41,764	43,774	12,867	-	5,224	9,259	32,906	35,627	10,458	-	3,991	6,242	444,448	
1985	187,686	98,471	34,203	3,432	7,032	42,147	125,322	83,530	22,239	569	4,108	25,305	1,157,073	
1986	268,877	100,824	43,294	1,843	2,831	24,775	157,675	73,377	29,200	187	1,471	9,013	1,363,082	
1987	155,796	62,565	27,380	455	2,905	21,225	108,024	44,977	12,262	124	1,399	8,391	1,215,219	
1988	112,289	96,008	27,983	1,382	5,542	9,307	74,606	73,561	16,180	140	3,100	3,012	1,233,013	
1989	103,796	52,545	15,082	721	3,029	11,868	71,025	35,230	11,315	491	1,548	3,856	1,010,516	
1990	94,786	84,229	15,906	1,628	2,817	12,201	60,701	67,529	10,516	162	1,040	2,832	1,112,047	
1991	99,841	57,281	17,643	471	7,151	41,277	66,079	38,712	14,574	68	3,119	6,843	1,082,287	
1992	69,959	26,742	3,222	2,516	4,010	7,891	50,182	18,381	1,826	413	1,761	2,997	1,012,822	
1993	111,852	51,733	6,845	1,238	2,174	6,332	64,444	28,738	4,643	288	1,208	3,434	836,572	
1994	66,031	25,227	2,254	203	3,983	13,623	38,170	14,382	1,517	129	2,251	5,443	601,325	
1995	34,791	15,998	1,525	168	1,929	10,603	20,387	9,743	765	139	1,068	3,937	498,743	
1997	43,566	7,077	2,777	35	1,003	10,427	23,890	3,979	1,453	19	619	2,113	508,297	
1998	40,723	25,075	3,541	480	1,204	1,831	25,841	16,766	2,257	316	508	540	473,105	440,653
1999	47,899	26,080	3,669	120	953	7,331	27,542	18,616	3,529	30	387	1,114	593,233	469,117
2000	46,612	9,405	2,095	20	1,502	4,638	27,352	5,284	1,228	12	527	857	588,006	453,065
2001	40,140	16,683	2,689	60	1,508	3,008	18,525	10,828	1,596	0	787	387	505,616	369,407
2002	29,699	10,876	1,702	0	555	445	15,054	7,341	1,442	0	247	94	500,372	366,549
2003	44,500	7,176	2,145	24	914	2,216	15,843	4,437	1,763	12	240	528	411,011	286,384
2004	42,298	4,583	1,288	29	570	2,290	17,263	3,570	1,177	5	135	364	366,349	259,584
2005	42,711	16,154	1,254	83	221	1,214	18,601	15,667	694	83	66	75	474,114	333,952
2008	43,584	25,169	2,310	114	1,522	1,397	11,880	20,730	1,843	14	957	38	521,586	340,255
2011	39,172	25,588	7,128	456	1,392	1,756	17,820	16,185	5,078	254	1,159	642	443,548	293,952

Catch rates for the time-series from 1977-2011 show major shifts in salmon and trout populations and the quality of angling in Lake Ontario (Fig. 3.1.4). Coho Salmon was the dominant salmonid in Lake Ontario during the 1970s. Catch rates of Rainbow Trout and Chinook Salmon increased as more were stocked in the 1980s but only Chinook Salmon has maintained high catch rates in recent years. Increases in catch rates of Rainbow Trout since 2005 have led increases for all salmonids.

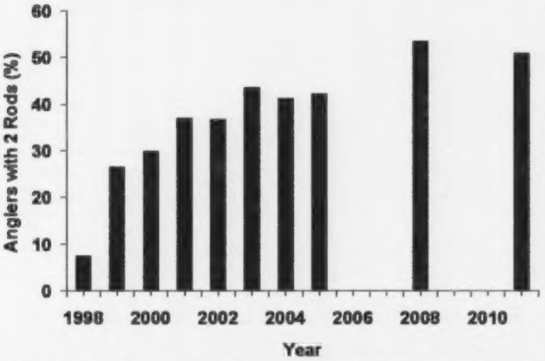

FIG. 3.1.2. The percent of anglers using 2 rods in the Ontario waters of Lake Ontario (excluding Kingston Basin), 1998 to 2011.

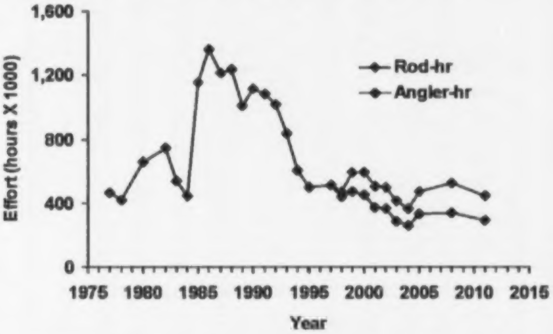

FIG. 3.1.3. The angler effort in the Ontario waters of Lake Ontario (excluding Kingston Basin), 1977 to 2011.

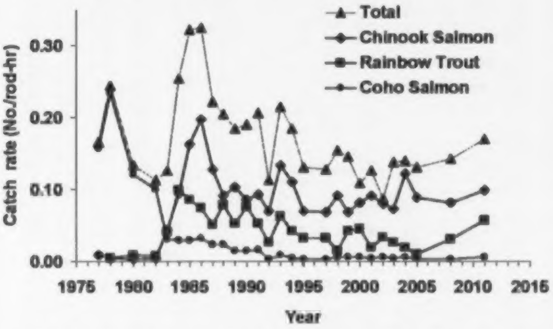

FIG. 3.1.4. The catch rate of salmon and trout in the Ontario waters of Lake Ontario (excluding Kingston Basin), 1977 to 2011.

3.2 Chinook Salmon Mark and Tag Monitoring

This is the second year of a joint assessment by NYSDEC and OMNR of Chinook Salmon fin clips and coded wire tags (CWTs) to determine fish origin (stocked or wild), distribution and movement. Detailed results from OMNR surveys are reported here. A joint report from both NYSDEC and OMNR can be found in the New York State Department of Environmental Conservation 2011 Annual Report[1]. In 2008, NYSDEC acquired an AutoFish System from Northwest Marine Technology to apply fin clips and coded wire tags to fish stocked in Lake Ontario. This system is in a mobile trailer and has since been used by NYSDEC and OMNR to mark all Chinook Salmon stocked into Lake Ontario with an adipose fin clip, and some of these fish have been tagged internally with a CWT in the nose to designate the agency and stocking location. Accordingly, all stocked Chinook Salmon of ages 0 to 3 observed in Lake Ontario in 2011 should be marked.

Chinook Salmon fin clip and CWT results are reported here from four OMNR surveys: i) Western Lake Ontario Angling Survey (Section 3.1), ii) Chinook Salmon Angling Tournament and Derby Sampling (reported here, only), iii) Eastern Lake Ontario and Bay of Quinte Fish Community Index Gillnetting (Section 2.2), and iv) Credit River Chinook Assessment (Section 2.7). Methods and detailed results from three of these surveys can be found in this Annual Report (Sections indicated in parenthesis). The gill nets effectively caught small Chinook Salmon, and complemented the angler programs that caught larger fish. The gill nets and angling programs targeted a mixed population of Chinook Salmon originating from widespread stocking and tributary spawning locations. The Credit River Chinook Assessment targeted fish returning to spawn only in the Credit River.

Angling Tournament and Derby Sampling was conducted alongside the Western Lake Ontario Angling Survey from May 1 to August 28, 2011 at selected boat ramps and marinas (Table 3.2.1). Chinook Salmon were measured, weighed, and

TABLE 3.2.1. Number of Chinook Salmon sampled at tournaments and derbies not included in Western Lake Ontario Angler Survey.

Date	Location	Number of samples
May 1	Port Dalhousie	32
June 25	Port Credit	20
June 25	Whitby	30
July 2	Whitby	21
July 23	Jordan Harbour	12
July 24	Whitby	21
July 30	Bluffers Park	34
July 31	Bowmanville	24
August 13	Whitby	25
August 27	Port Hope	15
Other (6)	Various	19
Total		253

examined for fin clips and CWTs. A sub-sample of Chinook Salmon otoliths and noses were collected for age interpretation and for CWT extraction, respectively. Ages were obtained by counting annuli on 136 thin sectioned otoliths from Chinook Salmon with fork length <900 mm. Age distributions on the remaining Chinook Salmon were obtained with monthly stratified age-length keys combining these and 143 samples from the Western Lake Ontario Angling Survey.

In the three Lake Ontario programs, a total of 558 Chinook Salmon aged 0-3 were sampled in 2011 (Table 3.2.2). Angling Tournament and Derby caught Chinook Salmon were larger and older; 95% were age 2 or 3 years. A broader range of ages were observed in the Western Lake Ontario Angling Survey (Table 3.2.2). The gill net samples complemented the angling surveys as 93% were age 0 or 1 year. The percent of stocked Chinook Salmon was remarkably similar (60 to 65%) for the 2008, 2009, and 2011 year-classes (Table 3.2.2). In contrast, the percent of stocked Chinook Salmon for the 2010 year-class was much lower (34%). These patterns are not correlated with numbers stocked. It is unclear if this pattern is related to variation in survival of stocked Chinook Salmon or natural reproduction.

Eighty-four Chinook Salmon were sampled in the Credit River as part of the spawn collection for Normandale Fish Culture Station. Most of these fish were age 1-3 and all had an adipose clip indicating very little natural reproduction in the Credit River during 2008-2010. One age-4 Chinook Salmon was observed with an adipose fin clip, indicating it had been stocked in 2007 as part of a pen-rearing project at Barcovan or Wellington by the Central Lake Ontario Sport Anglers.

CWTs were found in 76 Chinook Salmon in the angler surveys (Table 3.2.3) and another 8 fish in gill nets (Table 3.2.4). One clear pattern emerges from these data: younger Chinook Salmon (age-0 and 1) including those stocked in New York State use the north shore of Lake Ontario as nursery and juvenile habitat. Chinook Salmon stocked by Ontario show up along the Ontario shoreline in greater numbers at age-2 and 3, likely on their return to spawn.

TABLE 3.2.2. Catch of Chinook Salmon in index gill nets and by anglers, organized by fin clip and year-class, during 2008-2011. The percent of the fish of stocked origin is indicated.

		Gill nets				Anglers				
Year-class	Fin clip	2008	2009	2010	2011	2010	2011[a]	2011[b]	Total	Percent stocked
2008	No clip	0	1	1	0	42	21	14	79	63%
	Adipose	3	2	1	1	53	51	25	136	
2009	No clip	-	2	12	1	56	52	54	177	60%
	Adipose	-	0	18	3	102	67	75	265	
2010	No clip	-	-	7	43	3	7	65	125	34%
	Adipose	-	-	3	14	0	3	45	65	
2011	No clip	-	-	-	3	-	1	2	6	65%
	Adipose	-	-	-	11	-	0	0	11	
Total		3	5	42	76	256	202	280	864	

[a] - Chinook Salmon Angling Tournament and Special Sampling

[b] - Western Lake Ontario Angling Survey

---

[1] Connerton, M.J., Balk, C.J., Prindle, S.E., Lantry, J.R., Daniels, M.E., Bowlby, J.N., Bronte, C., Holey, M. 2012. 2011 mass marking of Chinook Salmon in Lake Ontario. Section 3 in New York State Department of Environmental Conservation 2011 Annual Report, Bureau of Fisheries, Lake Ontario Unit and St. Lawrence River Unit to the Great Lake Fishery Commission's Lake Ontario Committee.

TABLE 3.2.3. Number of Chinook Salmon with coded wire tags caught by anglers during 2011 by stocking and capture locations (see Fig. 3.1.1 for a map of capture locations).

		Capture location					
Stocking year	Stocking location	Niagara	Hamilton	West Toronto	East Toronto	Whitby-Cobourg	Brighton-Wellington
2008	Salmon River				2	9	
	Credit River	1	1	3		5	
2009	Salmon River	1		3		9	2
	Port Dalhousie			1			
	Burlington Canal					1	
	Bronte Creek			1		2	1
	Credit River	1		2	2		
	Bluffer's Park					1	
	Bowmanville Creek			1			
2010	Sandy Creek			2			
	Salmon River	1		2	1	5	1
	Oswego River						1
	Genesee River					1	
	Oak Orchard Creek			1			3
	Eighteenmile Creek	1					1
	Niagara River				1		1
	Burlington Canal			1			
	Bronte Creek					1	
	Credit River		1		1		
	Bowmanville Creek			1			

TABLE 3.2.4. Number of Chinook Salmon with coded wire tags caught in index gill nets during 2011 by stocking and capture locations (see Section 2.2 for a map of capture locations).

		Capture location		
Stocking year	Stocking location	Cobourg	Brighton	Flat Point
2010	Niagara River	1		
	Little Sodus Bay		1	
	Salmon River			1
2011	Eighteenmile Cr	3		
	Little Sodus Bay	1		
	Sandy Creek	1		

4. Commercial Fishery

4.1 Quota and Harvest Summary

Lake Ontario supports a locally important commercial fish industry. The commercial harvest comes primarily from the Canadian waters of Lake Ontario east of Brighton (including the Bay of Quinte) and the St. Lawrence River (Fig. 4.1.1). Commercial harvest statistics for 2011 were obtained from the commercial fish harvest information system (CFHIS) which is managed, in partnership, by the Ontario Commercial Fisheries Association (OCFA) and the Ontario Ministry of Natural Resources. Commercial quota, harvest and landed value statistics for Lake Ontario, the St. Lawrence River and East and West Lakes, for 2011, are shown in Tables 4.1.1 (base quota), 4.1.2 (issued quota), 4.1.3 (harvest) and 4.1.4 (landed value).

The total harvest of all species was 681,709 lb ($866,471) in 2011, up 45,791 lb (7%) from 2010. The harvest (landed value) for Lake Ontario, the St. Lawrence River, and East and West Lakes was 451,517 lb ($588,458), 172,506 lb ($221,908), and 57,840 lb ($60,453), respectively (Fig. 4.1.2 and Fig. 4.1.3). Yellow Perch were the dominant species in the harvest for both Lake Ontario and St. Lawrence River while sunfish was the dominant species in East and West Lakes.

Major Fishery Trends

Harvest and landed value trends for Lake Ontario and the St. Lawrence River are shown in Fig. 4.1.4 and Fig. 4.1.5. Having declined in the early 2000s the harvest appears to have stabilized at about 400,000 lb ($450,000) and 150,000 lb ($175,000) for Lake Ontario (Fig. 4.1.4) and the St. Lawrence River (Fig. 4.1.5) respectively.

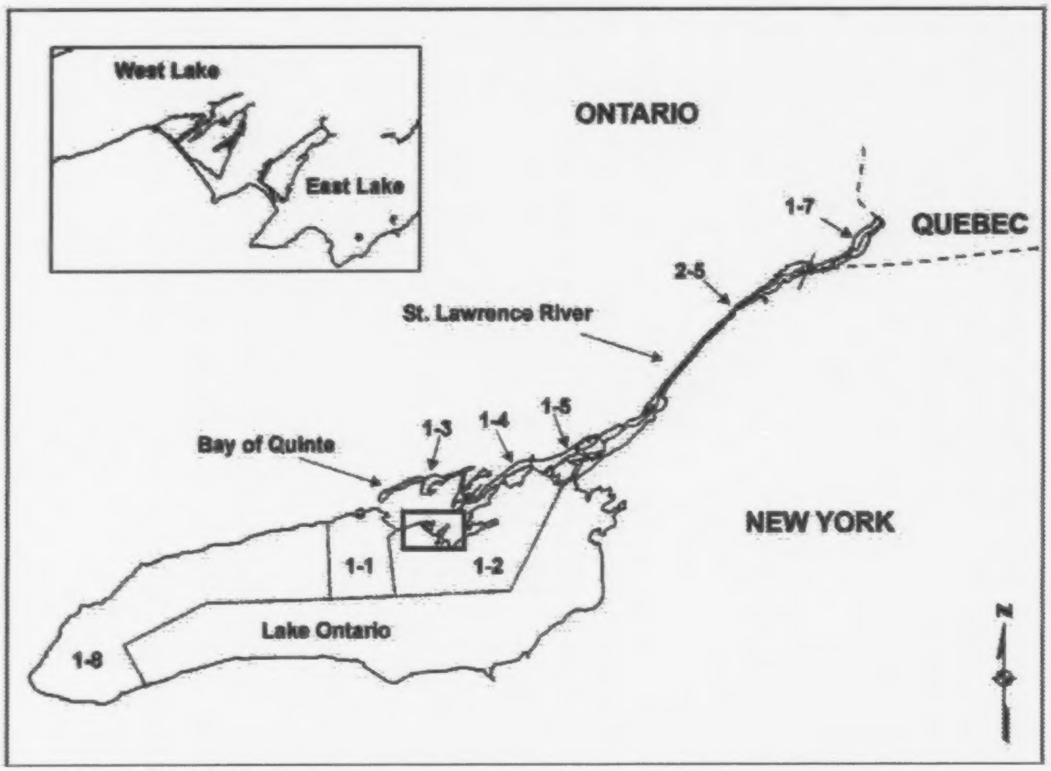

FIG. 4.1.1. Map of Lake Ontario and the St. Lawrence River showing commercial fishing quota zones in Canadian waters.

TABLE 4.1.1. Commercial fish **base quota** (lb), by quota zone, in the Canadian waters of Lake Ontario and the St. Lawrence River, East and West Lakes (two Lake Ontario embayments), 2011.

	Lake Ontario					St. Lawrence River			East Lake	West Lake	Base Quota by Waterbody		
Species	1-1	1-2	1-3	1-4	1-8	1-5	2-5	1-7	1	1	Lake Ontario	St. Lawrence River	Total
Black Crappie	4,540	3,000	14,824	800	2,800	14,170	17,590	4,840	3,100	9,850	25,964	36,600	75,514
Bowfin	0	0	0	0	500	0	0	0	0	0	500	0	500
Brown Bullhead	36,200	0	0	0	0	0	0	0	14,350	27,220	36,200	0	77,770
Lake Whitefish	7,275	76,023	13,675	20,313	208	0	0	0	0	0	117,494	0	117,494
Sunfish	28,130	0	0	0	0	0	0	0	14,600	18,080	28,130	0	60,810
Walleye	4,255	35,308	0	8,308	800	0	0	0	0	0	48,671	0	48,671
Yellow Perch	35,590	179,340	91,752	126,170	13,000	68,976	82,814	16,200	1,400	4,420	445,852	167,990	619,662
Total	115,990	293,671	120,251	155,591	17,308	83,146	100,404	21,040	33,450	59,570	702,811	204,590	1,000,421

TABLE 4.1.2. Commercial fish **issued quota** (lb), by quota zone, in the Canadian waters of Lake Ontario and the St. Lawrence River, East and West Lakes (two Lake Ontario embayments), 2011.

	Lake Ontario					St. Lawrence River			East Lake	West Lake	Issued Quota by Waterbody		
Species	1-1	1-2	1-3	1-4	1-8	1-5	2-5	1-7	1	1	Lake Ontario	St. Lawrence River	Total
Black Crappie	2,500	1,850	11,763	400	1,400	13,255	8,795	2,420	3,100	10,775	17,913	24,470	56,258
Bowfin	0	0	0	0	250	0	0	0	0	0	250	0	250
Brown Bullhead	18,100	0	0	0	0	0	0	0	14,350	27,220	18,100	0	59,670
Lake Whitefish	1,586	104,201	12,905	8,754	104	0	0	0	0	0	127,550	0	127,550
Sunfish	17,000	0	0	0	0	0	0	0	16,100	28,000	17,000	0	61,100
Walleye	1,207	12,942	0	29,607	400	0	0	0	0	0	44,156	0	44,156
Yellow Perch	17,795	99,056	97,206	106,939	6,500	68,976	67,479	21,200	1,400	4,420	327,496	157,655	490,971
Total	58,188	218,049	121,874	145,700	8,654	82,231	76,274	23,620	34,950	70,415	552,465	182,125	839,955

TABLE 4.1.3. Commercial **harvest** (lb), by quota zone, for fish species harvested from the Canadian waters of Lake Ontario and the St. Lawrence River, East and West Lakes (two Lake Ontario embayments), 2011.

	Lake Ontario					St. Lawrence River			East Lake	West Lake	Totals		
Species	1-1	1-2	1-3	1-4	1-8	1-5	2-5	1-7	1	1	Lake Ontario	St. Lawrence River	All Waterbodies
Black Crappie	231	0	7,651	22	0	7,626	1,274	1,344	21	2,315	7,904	10,244	20,484
Bowfin	493	0	2,530	0	0	1,886	1,733	345	172	45	3,023	3,964	7,204
Brown Bullhead	675	73	7,411	1,037	0	5,800	2,479	30,610	5	870	9,196	38,889	48,960
Common Carp	0	301	673	221	0	350	63	0	56	0	1,195	413	1,664
Freshwater Drum	13	713	11,059	10,140	0	0	0	0	4	0	21,925	0	21,929
Lake Herring (Cisco)	137	328	1,314	1,204	0	1	0	0	0	249	2,983	1	3,233
Lake Whitefish	904	73,074	3,588	645	0	0	0	0	0	0	78,211	0	78,211
Northern Pike	7,379	1,398	25,219	4,673	0	11,178	0	0	1,916	6,497	38,669	11,178	58,260
Rock Bass	1,012	1,040	7,957	2,173	0	859	854	0	2,156	2,794	12,182	1,713	18,845
Sunfish	5,350	0	86,689	601	0	5,358	4,396	5,508	12,779	22,209	92,640	15,262	142,890
Walleye	364	3,345	0	20,499	0	0	0	0	0	0	24,208	0	24,208
White Bass	0	12	0	143	0	0	0	0	0	11	155	0	166
White Perch	29	76	7,244	1,728	0	426	0	0	20	4,214	9,077	426	13,737
White Sucker	24	369	2,933	2,152	0	683	0	0	0	209	5,478	683	6,370
Yellow Perch	1,790	14,012	70,560	58,155	0	49,048	21,173	19,512	170	1,128	144,517	89,733	235,548
Total	18,401	94,741	234,828	103,393	0	83,215	31,972	57,319	17,299	40,541	451,363	172,506	681,709

TABLE 4.1.4. Commercial **harvest (lb), price per lb, and landed value** for fish species harvested from the Canadian waters of Lake Ontario and the St. Lawrence River, and the total for all waterbodies including East and West Lakes.

	Lake Ontario			St. Lawrence River			All Waterbodies		
Species	Harvest	Price per lb	Landed value	Harvest	Price per lb	Landed value	Harvest	Price per lb	Landed value
Black Crappie	7,904	$3.40	$26,861	10,244	$2.68	$27,410	20,484	$3.09	$63,300
Bowfin	3,023	$0.28	$855	3,964	$0.53	$2,108	7,204	$0.43	$3,114
Brown Bullhead	9,196	$0.22	$2,060	38,889	$0.30	$11,695	48,960	$0.27	$13,062
Common Carp	1,195	$0.10	$115	413	$0.18	$75	1,664	$0.11	$179
Freshwater Drum	21,925	$0.09	$2,001	0			21,929	$0.09	$2,002
Lake Herring (Cisco)	2,983	$0.27	$792	1	$0.50	$1	3,233	$0.26	$852
Lake Whitefish	78,211	$0.94	$73,397	0			78,211	$0.94	$73,397
Northern Pike	38,669	$0.23	$9,062	11,178	$0.27	$2,980	58,260	$0.23	$13,604
Rock Bass	12,182	$0.52	$6,357	1,713	$0.38	$653	18,845	$0.50	$9,501
Sunfish	92,640	$1.31	$121,140	15,262	$1.13	$17,240	142,890	$1.24	$177,708
Walleye	24,208	$2.37	$57,465	0			24,208	$2.37	$57,465
White Bass	155	$0.58	$90	0			166	$0.59	$97
White Perch	9,077	$0.53	$4,850	426	$0.66	$282	13,737	$0.56	$7,748
White Sucker	5,478	$0.10	$565	683	$0.10	$71	6,370	$0.10	$657
Yellow Perch	144,517	$1.96	$282,847	89,733	$1.78	$159,394	235,548	$1.88	$443,783
Total	451,363		$588,458	172,506		$221,908	681,709		$866,471

Major Species

For major species, commercial harvest relative to issued and base quota information, including annual trend, is shown in Fig. 4.1.6 to Fig. 4.1.17. Price-per-lb trends are also shown. Species-specific price-per-lb values are means across quota zones within a major waterbody (i.e., Lake Ontario and the St. Lawrence River).

Yellow Perch

Yellow Perch 2011 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.6. Overall, 38% (235,548 lb) of the Yellow Perch base quota was harvested in 2011. The highest Yellow Perch harvest came from quota zones 1-3, 1-4 and 1-5. Relatively small proportions of base quota were harvested in quota zones 1-1, 1-2 and 2-5.

Trends in Yellow Perch quota (base), harvest and price-per-lb are shown Fig. 4.1.7. Quota has remained more or less constant since 2000 except in quota zone 1-7 where quota has increased significantly and allowed for increased harvest. All base quota is issued and harvested in quota zone 1-7. Harvest has declined significantly since the early 2000s in quota zone 1-2. Harvest has increased, at least somewhat, since the early 2000s in all other major quota zones (Fig. 4.1.7). Yellow Perch price-per-lb has shown modest improvement in recent years.

Lake Whitefish

Lake Whitefish 2011 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.8. Overall, 67% (78,211 lb) of the Lake Whitefish base quota was harvested in 2011. The highest Lake Whitefish harvest came from quota zone 1-2. Lake Whitefish is managed as one fish population across quota zones. Therefore, quota can be transferred among quota zones. As a result, in 2011, issued quota was higher than base quota in quota zone 1-2 (Fig. 4.1.8). Relatively small proportions of base quota were harvested in quota zones 1-1, 1-3 and 1-4.

Trends in Lake Whitefish quota (base), harvest and price-per-lb are shown Fig. 4.1.9. Quota has remained constant for the last four years (just under 120,000 lb for all quota zones combined). Harvest only approaches quota in quota zone 1-2.

Seasonal whitefish harvest and biological

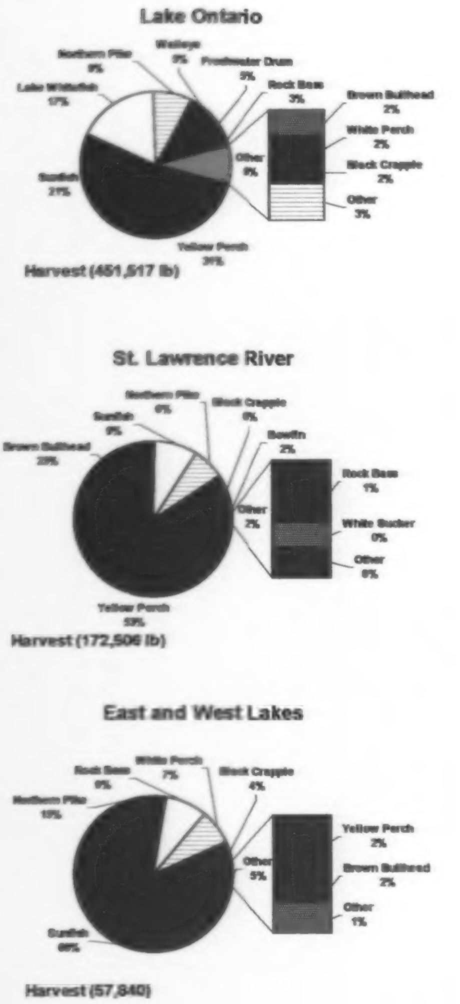

FIG. 4.1.2. Pie-charts showing breakdown of 2011 commercial harvest by species (**% by weight**) for Lake Ontario (quota zones 1-1, 1-2, 1-3, 1-4 and 1-8), the St. Lawrence River (quota zones 1-5, 2-5 and 1-7), and for East and West Lakes combined.

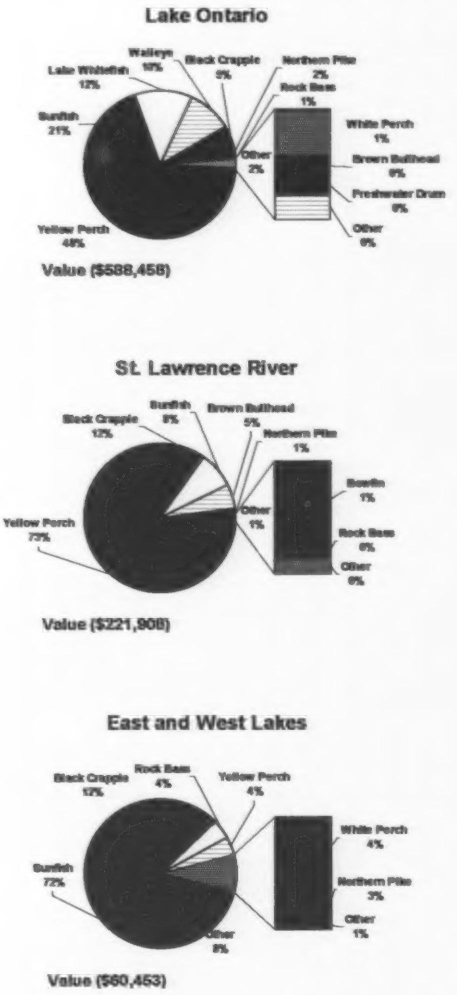

FIG. 4.1.3. Pie-charts showing breakdown of 2011 commercial harvest by species (**% by landed value**) for Lake Ontario (quota zones 1-1, 1-2, 1-3, 1-4 and 1-8), the St. Lawrence River (quota zones 1-5, 2-5 and 1-7), and for East and West Lakes combined.

attributes (e.g., size and age structure) information are reported in Section 4.2. Lake Whitefish price-per-lb is currently relatively high.

Walleye

Walleye 2011 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.10. Overall, 50% (24,208 lb) of the Walleye base quota was harvested in 2011. The highest Walleye harvest came from quota zone 1-4. Relatively small proportions of base quota were harvested in quota zones 1-1 and 1-2. Walleye (like Lake Whitefish) is managed as one fish population across quota zones. Therefore, quota can be transferred among quota zones. In 2011, this resulted in issued quota being considerably higher than base quota in quota zone 1-4 (Fig. 4.1.10).

Trends in Walleye quota (base), harvest and price-per-lb are shown Fig. 4.1.11. Quota has remained constant since the early 2000s (just

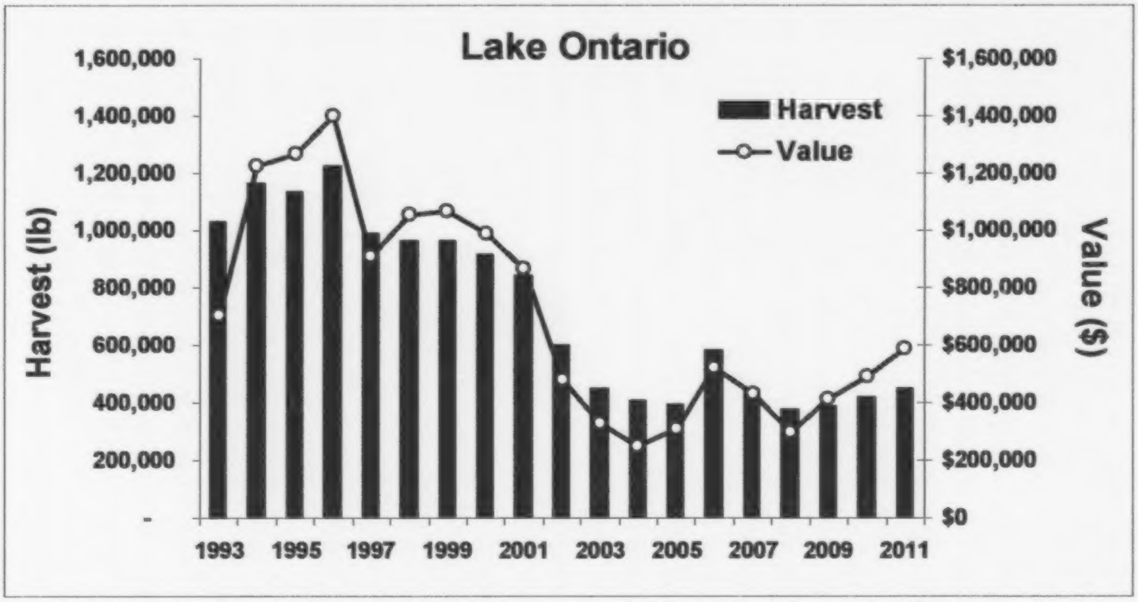

FIG. 4.1.4. Total commercial fishery harvest and value for **Lake Ontario** (Quota Zones 1-1, 1-2, 1-3 ,1-4 and 1-8) 1993-2011.

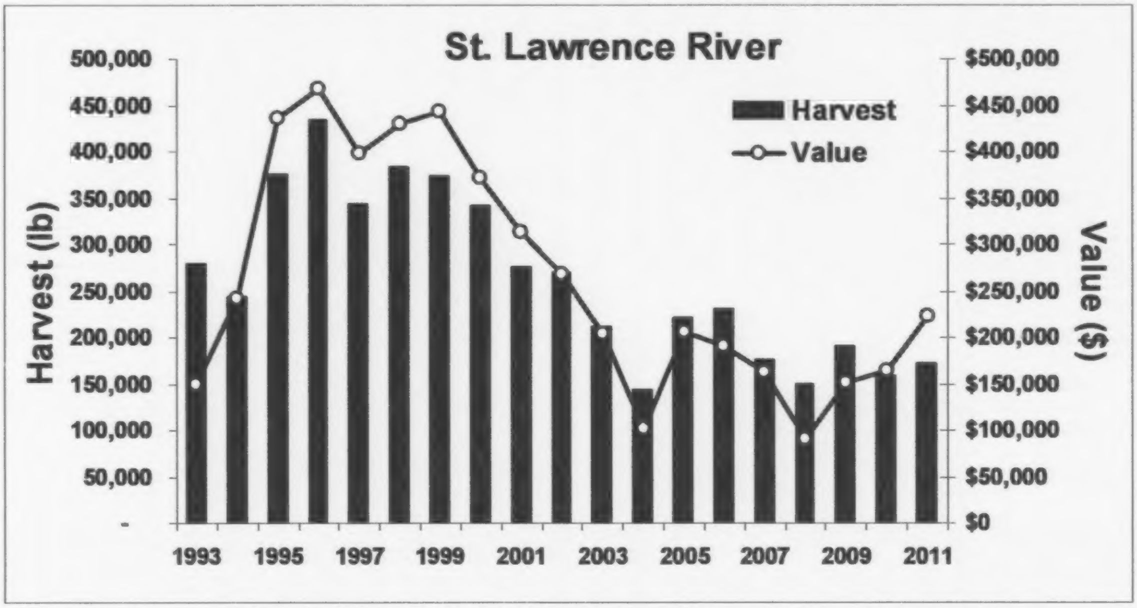

FIG. 4.1.5. Total commercial fishery harvest and value for the **St. Lawrence River** (Quota Zones 1-5, 2-5 and 1-7), 1993-2011.

under 50,000 lb for all quota zones combined). Walleye price-per-lb is currently high.

Black Crappie

Black Crappie 2011 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.12. Overall, only 27% (20,484 lb) of the Black Crappie base quota was harvested in 2011. The highest Black Crappie harvest came from quota zones 1-3 and 1-5. Only a small proportion of base quota were harvested in all other quota zones .

Trends in Black Crappie quota (base), harvest and

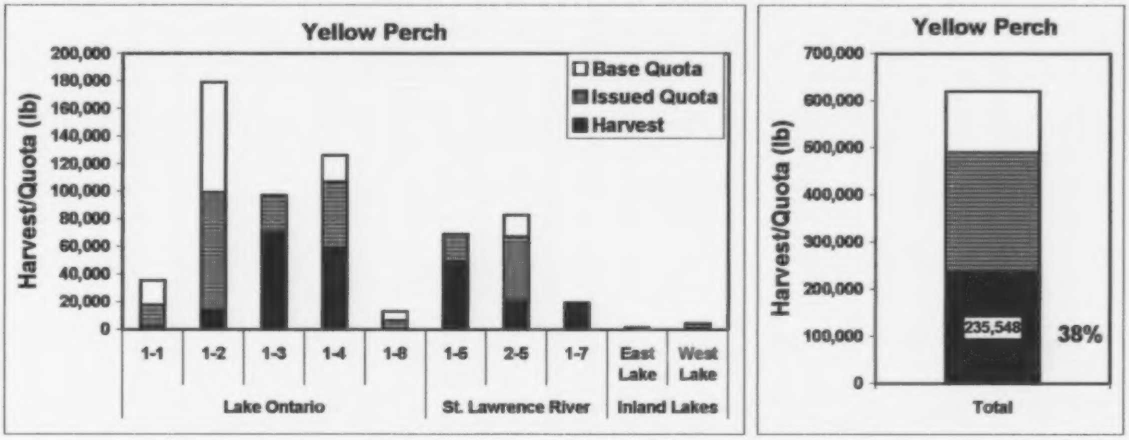

FIG. 4.1.6. **Yellow Perch** commercial harvest relative to issued and base quota by quota zone (left panel) and total for all quota zones combined (right panel), 2011.

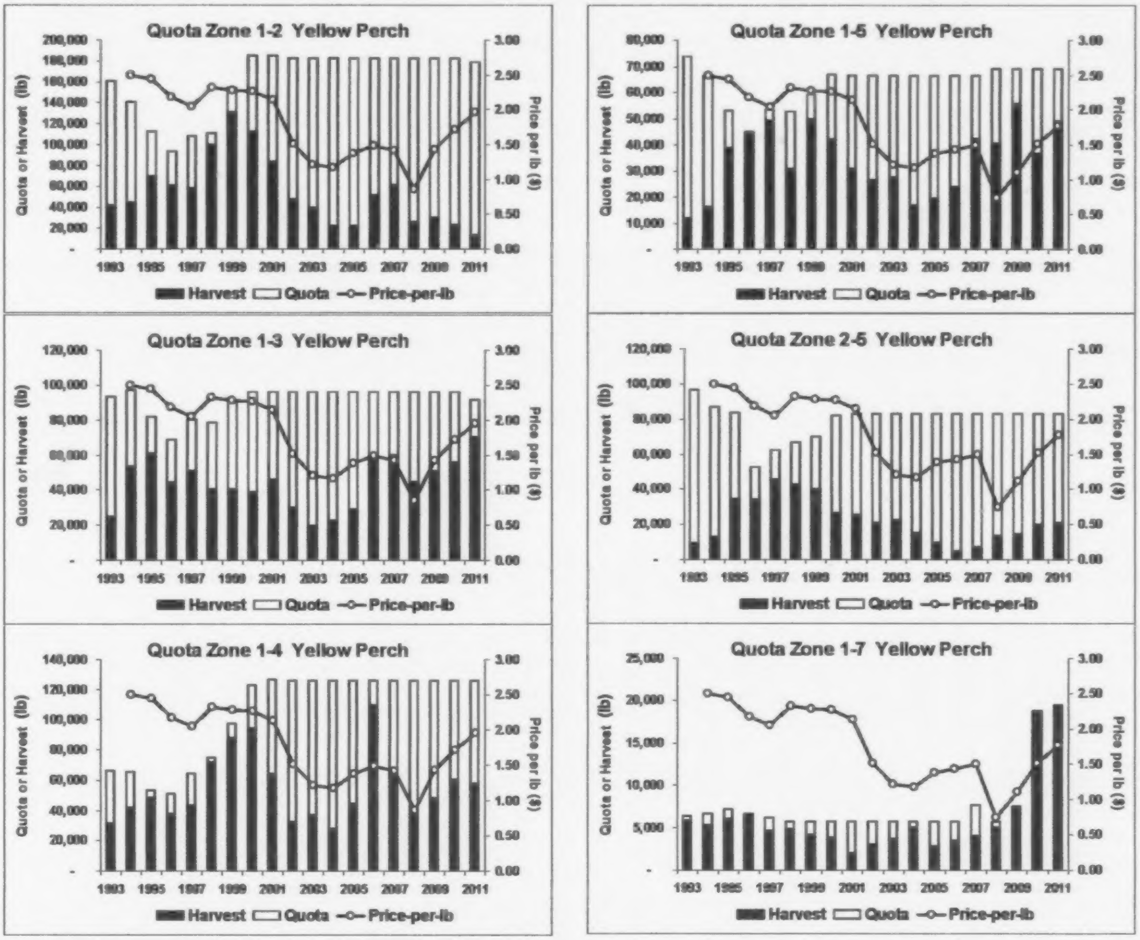

FIG. 4.1.7. Commercial base quota, harvest and price-per-lb for **Yellow Perch** in Quota Zones 1-2, 1-3, 1-4, 1-5, 2-5 and 1-7, 1993-2011.

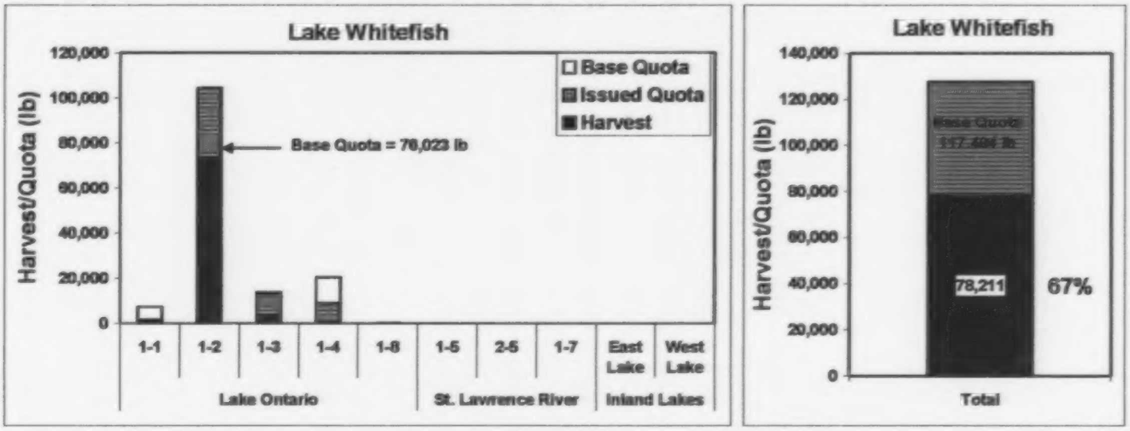

FIG. 4.1.8. **Lake Whitefish** commercial harvest relative to issued and base quota by quota zone (left panel) and total for all quota zones combined (right panel), 2011.

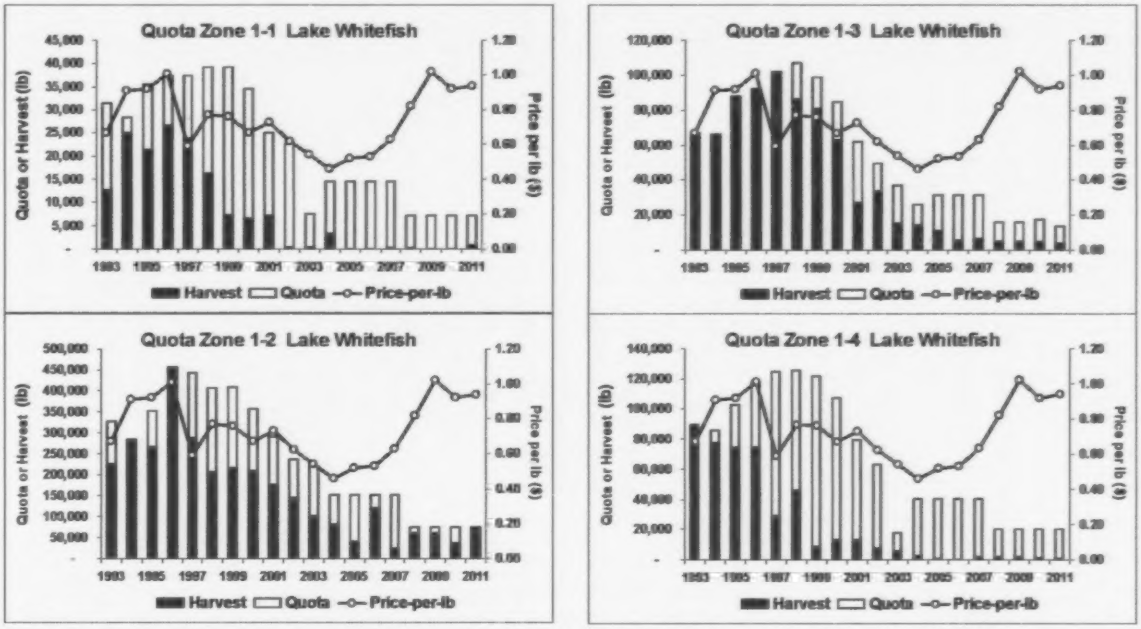

FIG. 4.1.9. Commercial base quota, harvest and price-per-lb for **Lake Whitefish** in Quota Zones 1-1, 1-2, 1-3 and 1-4, 1993-2011.

price-per-lb are shown Fig. 4.1.13. Harvest in West Lake is currently low relative to past levels. Black Crappie price-per-lb is currently high.

Sunfish

Sunfish 2011 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.14. Only quota zones 1-1, East Lake and West Lake have quotas for Sunfish; quota is unlimited in the other zones. Most, if not all, of the quota in East and West Lakes is harvested. Most Sunfish harvest comes from quota zone 1-3, East Lake and West Lake.

Trends in Sunfish quota (base), harvest and price-per-lb are shown Fig. 4.1.15. Current harvest levels are relatively high in quota zones 1-1, 1-3, 1-4, East Lake and West Lake compared to past levels. Current harvest levels are relatively low in the St. Lawrence River quota zones (1-5, 2-5 and 1-7). Sunfish price-per-lb is currently high.

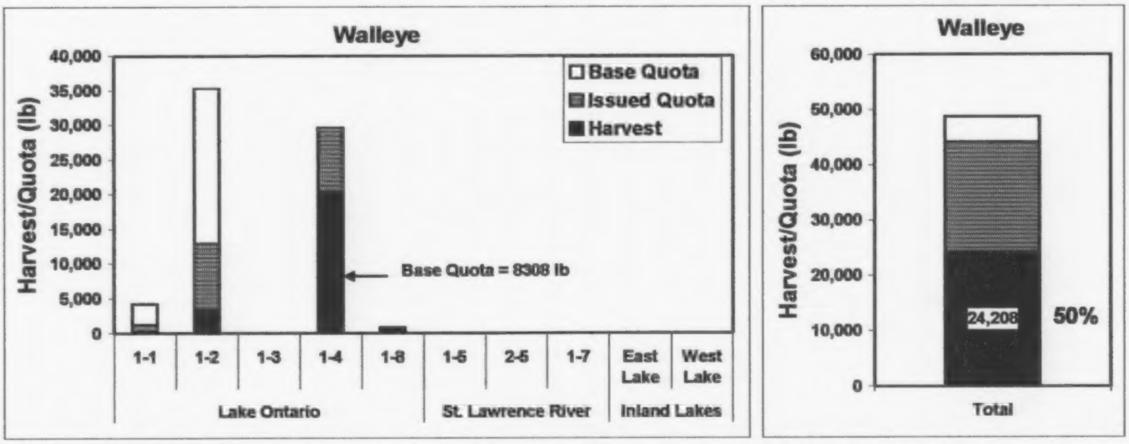

FIG. 4.1.10. **Walleye** commercial harvest relative to issued and base quota by quota zone (left panel) and total for all quota zones combined (right panel), 2011.

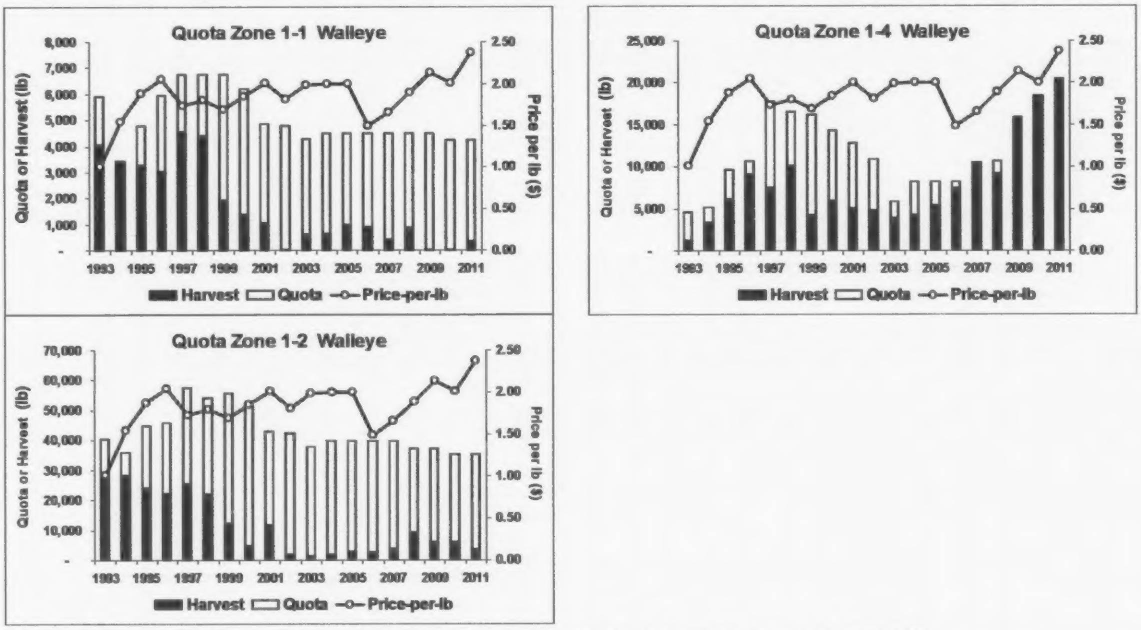

FIG. 4.1.11. Commercial base quota, harvest and price-per-lb for **Walleye** in Quota Zones 1-1, 1-2 and 1-4, 1993-2011.

Brown Bullhead

Brown Bullhead 2011 commercial harvest relative to issued and base quota by quota zone and total for all quota zones combined is shown in Fig. 4.1.16. Only quota zones 1-1, East Lake and West Lake have quotas for Brown Bullhead; quota is unlimited in the other zones. In the quota zones with quota restrictions, only a very small proportion of the quota was actually harvested. Most Brown Bullhead harvest comes from quota zone 1-7.

Trends in Brown Bullhead quota (base), harvest and price-per-lb are shown Fig. 4.1.17. With the exception of quota zone 1-7, current harvest levels are extremely low relative to past levels. Price-per-lb is currently low as well.

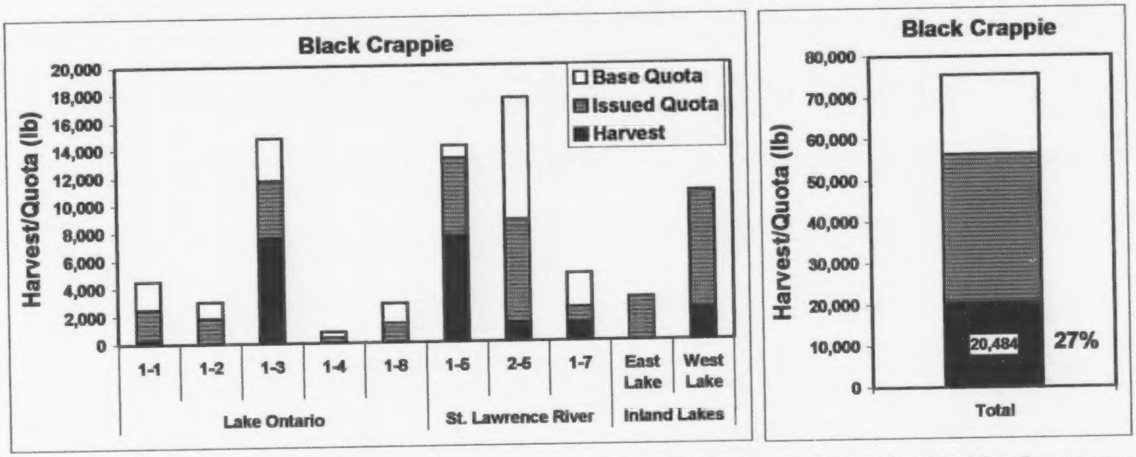

FIG. 4.1.12. **Black Crappie** commercial harvest relative to issued and base quota by quota zone (left panel) and total for all quota zones combined (right panel), 2011.

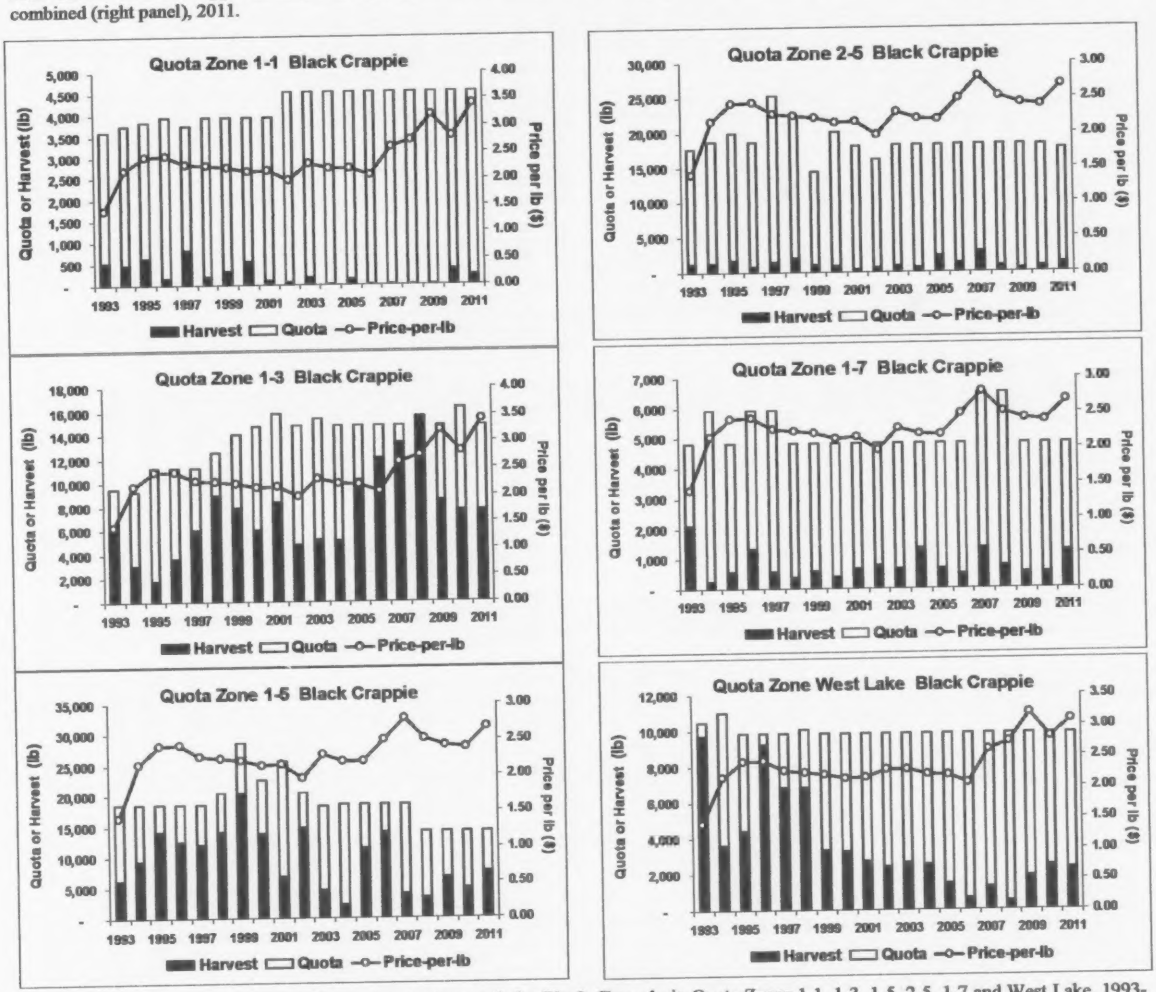

FIG. 4.1.13. Commercial base quota, harvest and price-per-lb for **Black Crappie** in Quota Zones 1-1, 1-3, 1-5, 2-5, 1-7 and West Lake, 1993-2011.

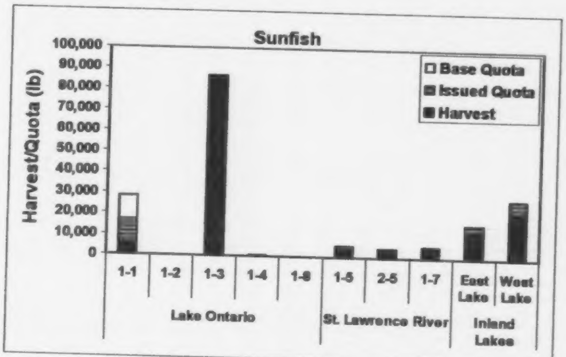

FIG. 4.1.14. **Sunfish** commercial harvest relative to issued and base quota for quota zones 1-1, East Lake and West Lake), 2011. The remaining quota zones have unlimited quota.

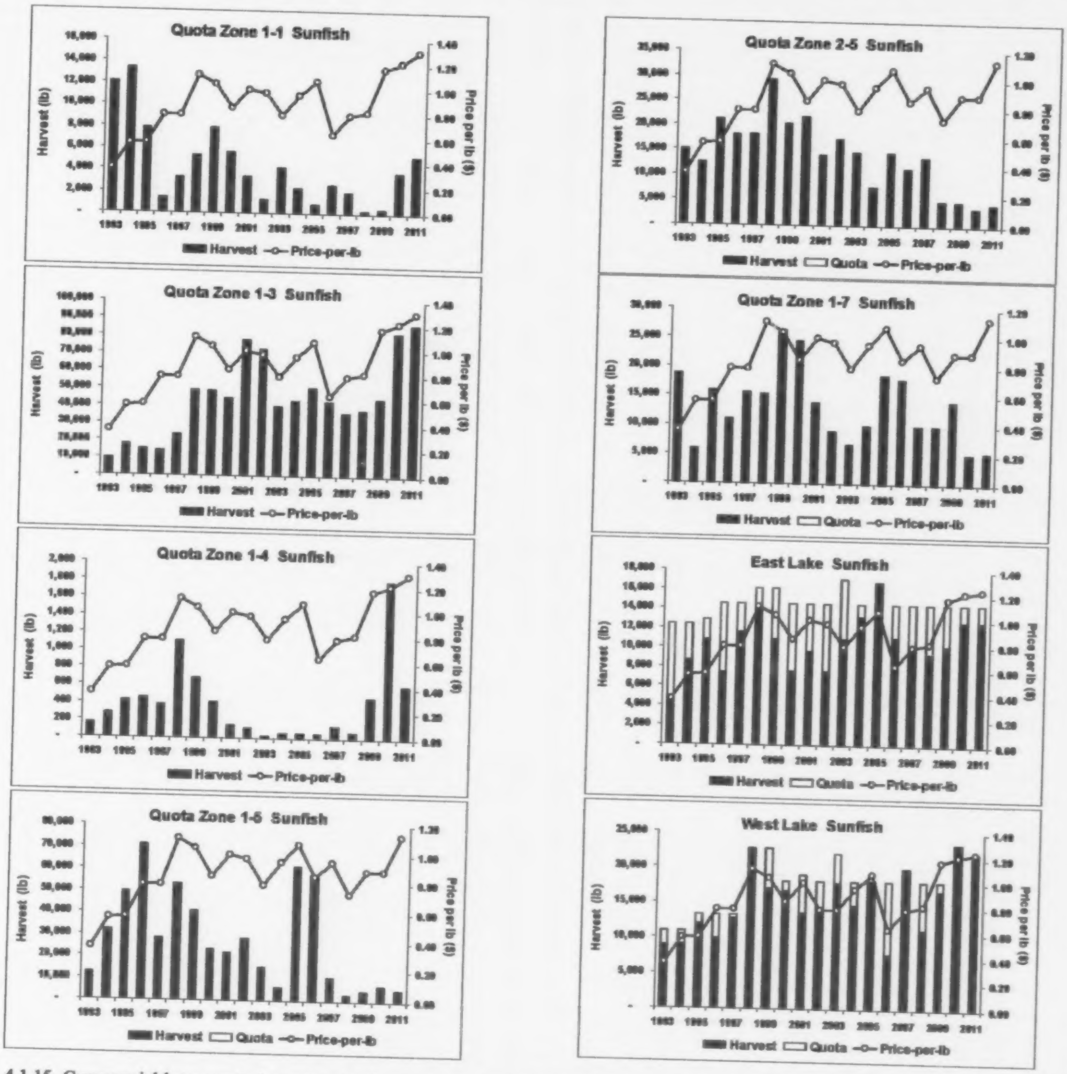

FIG. 4.1.15. Commercial base quota, harvest and price-per-lb for **Sunfish** in Quota Zones 1-1, 1-3, 1-4, 1-5, 2-5 and 1-7, East Lake and West Lake, 1993-2011.

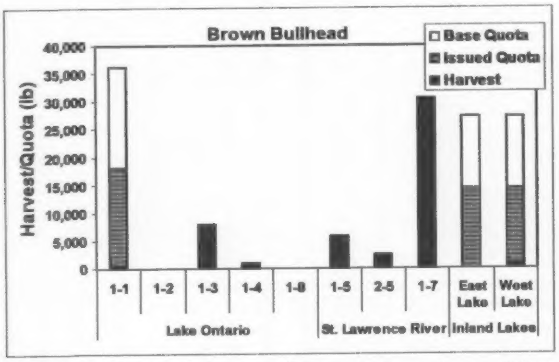

FIG. 4.1.16. **Brown Bullhead** commercial harvest relative to issued and base quota for quota zones 1-1, East Lake and West Lake), 2011. The remaining quota zones have unlimited quota.

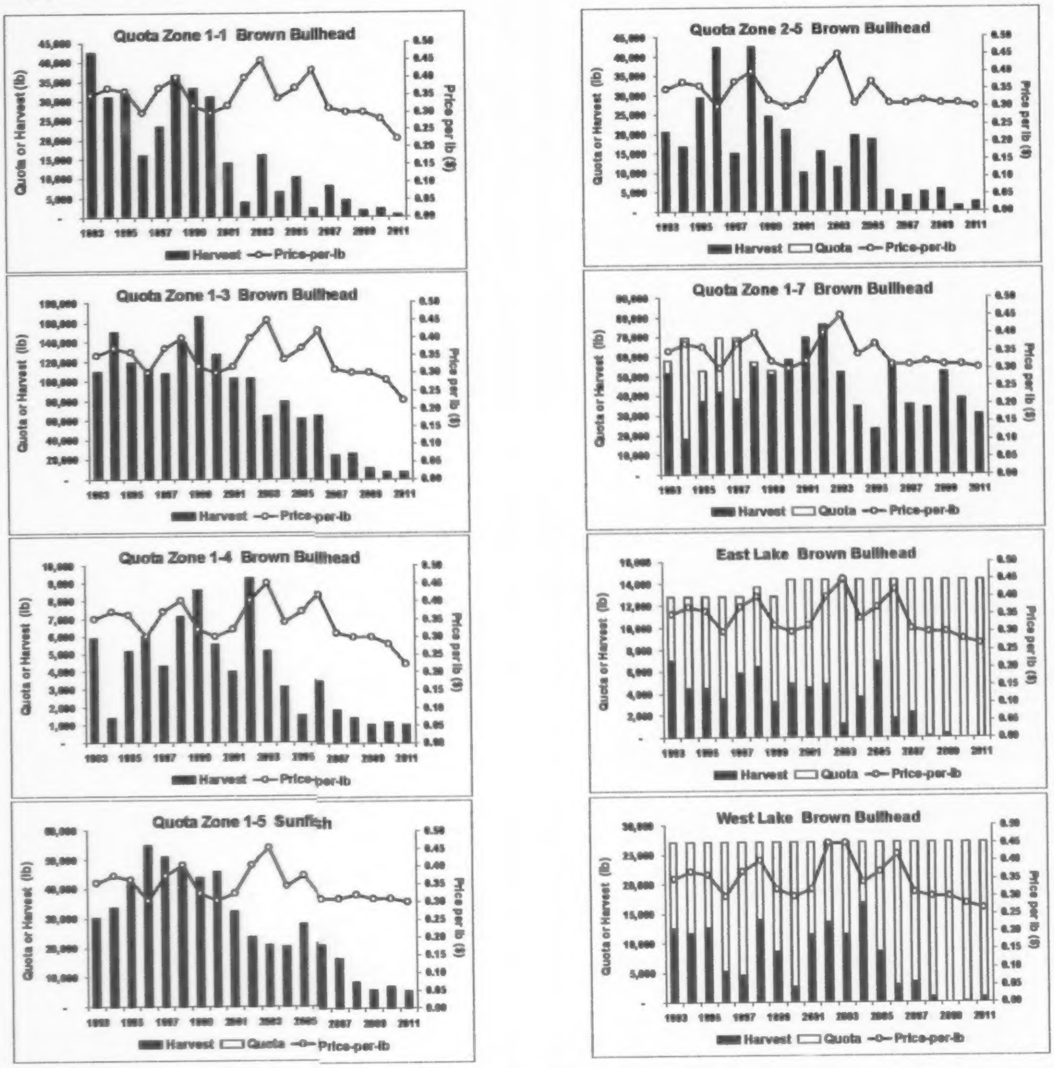

FIG. 4.1.17. Commercial base quota, harvest and price-per-lb for **Brown Bullhead** in Quota Zones 1-1, 1-3, 1-4, 1-5, 2-5 and 1-7, East Lake and West Lake, 1993-2011.

4.2 Lake Whitefish Commercial Catch Sampling

Sampling of commercially harvested Lake Whitefish for biological attribute information occurs annually. While total Lake Whitefish harvest can be determined from commercial fish Daily Catch Reports (DCRs; see section 4.1), biological sampling of the catch is necessary to breakdown total harvest into size and age-specific harvest. Age-specific harvest data can then be used in catch-age modeling to estimate population size and mortality schedule.

Commercial Lake Whitefish harvest and fishing effort by gear type, month and quota zone for 2011 is reported in Table 4.2.1. Most of the harvest was taken in gillnets, 95% by weight; 5% of the harvest was taken in impoundment gear. Gillnet fishing during November in quota zone 1-2 accounted for 53% of the total harvest and 55% of the harvest in this gear type but only 23% of the total gillnet effort. Most impoundment gear harvest and effort occurred in October and November in quota zone 1-3 (Table 4.2.1).

Biological sampling focused on the November spawning-time gillnet fishery on the south shore of Prince Edward County (quota zone 1-2), and the October/November spawning-time impoundment gear fishery in the Bay of Quinte (quota zone 1-3). The Lake Whitefish sampling design involves obtaining large numbers of length tally measurements and a smaller length-stratified sub-sample for more detailed biological sampling for the lake (quota zone 1-2) and bay (quota zone 1-3) spawning stocks. Whitefish length and age distribution information is presented in (Fig. 4.2.1 and Fig. 4.2.2). In total, fork length was measured for 1,039 fish and age was interpreted using otoliths for 305 fish (Table 4.2.2, Fig. 4.2.1 and 4.2.2).

Lake Ontario Gillnet Fishery (quota zone 1-2)

The mean fork length and age of Lake Whitefish harvested during the gillnet fishery in quota zone 1-2 were 478 and 11.7 years respectively (Fig. 4.2.1). Fish ranged from ages

TABLE 4.2.1. Lake Whitefish harvest (lb) and fishing effort (yards of gillnet or number of impoundment nets) by gear type, month and quota zone. Harvest and effort value in ***bold italic*** represent months and quota zones where whitefish biological samples were collected.

		Harvest (lb)				Effort (yards or number of nets)			
Gear type	Month	1-1	1-2	1-3	1-4	1-1	1-2	1-3	1-4
Gillnet	Jan				17				1,440
	Feb				96				960
	Mar		1,761		56		5,400		580
	Apr		1,291				10,000		
	May		***2,115***				***21,110***		
	Jun		2,218				7,570		
	Jul		9,091				37,500		
	Aug		3,579				17,600		
	Sep		4,019		166		13,400		900
	Oct		2,335		14		3,360		420
	Nov	832	***41,195***		175	1,000	***39,260***		1,480
	Dec		5,469		16		8,200		1,120
Impoundment	Mar			5				5	
	Apr			61	42			61	42
	May			9	50			9	50
	Jun				7				7
	Oct			***867***				***867***	
	Nov	73		***2,646***	6	73		***2,646***	6

TABLE 4.2.2. Age-specific vital statistics of **Lake Whitefish** sampled and harvested including number aged, number measured for length, and proportion by number of fish sampled, harvest by number and weight (kg), and mean weight (kg) and fork length (mm) of the harvest for quota zones 1-2 and 1-3.

Quota zone 1-2 (Lake stock)								Quota zone 1-3 (Bay stock)							
	Sampled			Harvested					Sampled			Harvested			
Age (years)	Number aged	Number lengthed	Proportion	Number	Weight (kg)	Mean weight (kg)	Mean length (mm)	Age (years)	Number aged	Number lengthed	Proportion	Number	Weight (kg)	Mean weight (kg)	Mean length (mm)
1	-	-	0.000	-	-			1	-	-	0.000	-	-		
2	-	-	0.000	-	-			2	-	-	0.000	-	-		
3	-	-	0.000	-	-			3	-	-	0.000	-	-		
4	-	-	0.000	-	-			4	-	-	0.000	-	-		
5	5	17	0.019	517	492	0.951	435	5	3	6	0.024	31	26	0.855	430
6	39	141	0.160	4,253	4,259	1.001	444	6	7	16	0.063	82	79	0.975	436
7	37	127	0.144	3,828	3,900	1.019	447	7	8	16	0.061	80	81	1.012	445
8	27	107	0.121	3,226	3,509	1.088	451	8	19	41	0.162	210	225	1.073	456
9	23	87	0.098	2,611	2,733	1.047	456	9	28	73	0.288	373	436	1.169	464
10	15	65	0.074	1,956	2,290	1.170	470	10	3	7	0.029	37	43	1.162	472
11	5	27	0.030	805	1,107	1.376	487	11	1	2	0.007	8	7	0.845	444
12	3	17	0.019	509	640	1.256	482	12	7	16	0.063	82	115	1.394	485
13	2	10	0.011	298	367	1.233	485	13	6	22	0.087	113	178	1.580	509
14	3	17	0.019	507	647	1.275	488	14	-	-	0.000	-	-		
15	-	-	0.000	-	-			15	1	3	0.011	15	19	1.256	481
16	1	4	0.004	112	186	1.666	531	16	4	10	0.039	51	77	1.531	510
17	5	34	0.039	1,035	1,403	1.355	492	17	3	6	0.024	31	36	1.159	478
18	12	66	0.075	1,989	2,543	1.279	497	18	2	3	0.012	16	19	1.222	507
19	6	42	0.047	1,250	2,119	1.695	518	19	2	6	0.023	30	34	1.141	483
20	8	45	0.051	1,355	2,321	1.713	532	20	3	14	0.057	73	135	1.835	535
21	6	42	0.047	1,253	2,359	1.882	546	21	5	13	0.051	66	116	1.754	537
22	2	13	0.015	391	664	1.697	524	22	-	-	0.000	-	-		
23	1	4	0.005	125	290	2.324	575	23	-	-	0.000	-	-		
24	2	8	0.009	253	595	2.358	570	24	-	-	0.000	-	-		
25	-	-	0.000	-	-			25	-	-	0.000	-	-		
26	-	-	0.000	-	-			26	-	-	0.000	-	-		
27	-	-	0.000	-	-			27	-	-	0.000	-	-		
28	-	-	0.000	-	-			28	-	-	0.000	-	-		
29	-	-	0.000	-	-			29	-	-	0.000	-	-		
30	1	11	0.012	332	670	2.015	548	30	-	-	0.000	-	-		
Total	203	884	1	26,606	33,146			Total	102	255	1	1,298	1,628		
Weighted mean						**1.246**		Weighted mean						**1.254**	

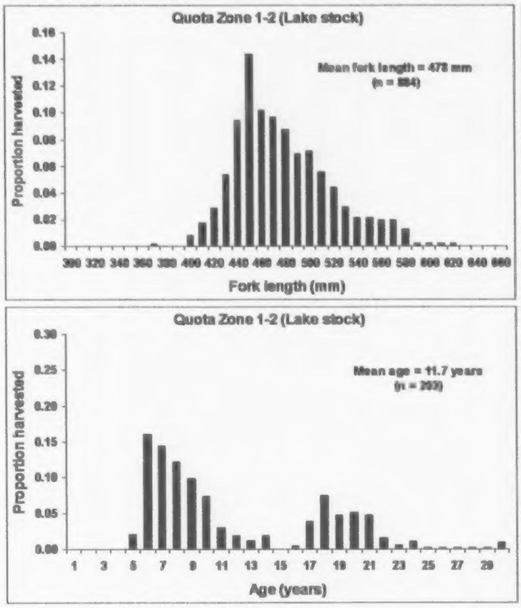

FIG. 4.2.1. Size and age distribution (by number) of **Lake Whitefish** sampled in quota zone 1-2 during the 2011 commercial catch sampling program.

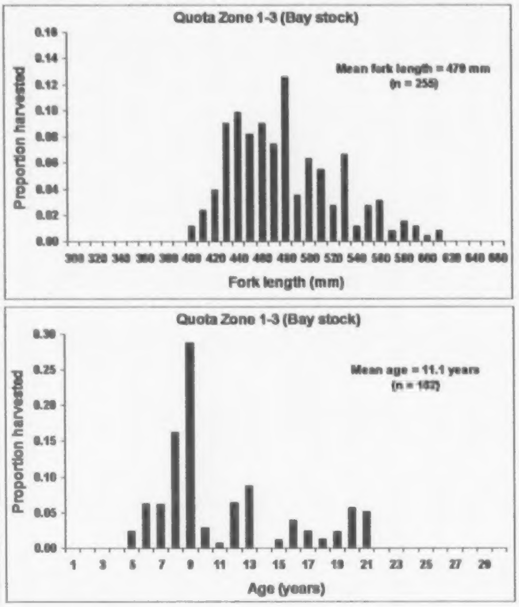

FIG. 4.2.2. Size and age distribution (by number) of **Lake Whitefish** sampled in quota zone 1-3 during the 2011 commercial catch sampling program.

5-30 years. The most abundant age-classes in the fishery were aged 6, 7, 8 and 9 which together comprised over 50% of the harvest by number). Older fish still figured prominently in the harvest. Fish aged 17, 18, 19, 20 and 21 comprised 26% of the harvest.

Bay of Quinte November Impoundment Gear Fishery (quota zone 1-3)

Mean fork length and age were 479 mm and 11.1 years, respectively (Fig. 4.2.2). Fish ranged from ages 5 to 21 years. The most abundant age-classes in the fishery were aged 8 and 9. The 1991 year-class, at age-20, represented 6% by number of the total harvest.

Condition

Lake Whitefish (Lake Ontario and Bay of Quinte spawning stocks and sexes combined) relative weight (see Rennie et al. 2008) is shown in Figure 4.2.3. Condition declined markedly in 1994 and has remained low, although the 2011 data points were among the highest values since 1994.

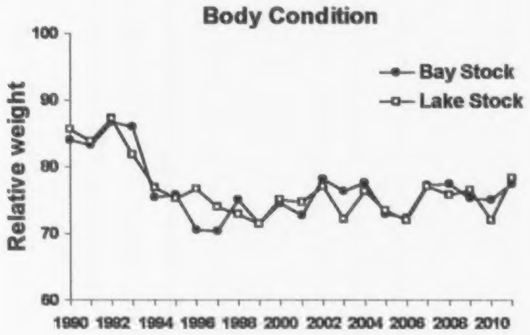

FIG. 4.2.3. **Lake Whitefish** (Lake Ontario and Bay of Quinte spawning stocks and sexes combined) relative weight (see [1]Rennie et al. 2008), 1990-2011.

[1] *Rennie, M.D. and R. Verdon. 2008. Development and evaluation of condition indices for the Lake Whitefish. N. Amer. J. Fish. Manage. 28:1270-1293.*

5. Age and Growth Summary

Biological sampling of fish from Lake Ontario Management Unit field projects routinely involves collecting and archiving structures used for such purposes as age interpretation and validation, origin determination (e.g. stocked versus wild), life history characteristics and other features of fish growth. In 2011, a total of 9,181 structures were collected and 2,589 were processed for age interpretation from 30 different fish species and 10 different field projects (Table 5.1).

TABLE 5.1. Species-specific summary of age and growth structures collected/archived (n = 9,181) and interpreted for age (2,589) in support of 10 different Lake Ontario Management Unit field projects in 2011.

	Scales		Otoliths		Cleithra		Opercula		Spines	
Species	Collected	Interpreted for age	Collected	Interpreted for age	Collected	Interpreted for age	Collected	Interpreted for age	Collected	Interpreted for age
Alewife	0	0	45	0	0	0	0	0	0	0
American eel	0	0	4	0	0	0	0	0	0	0
Atlantic salmon	5	0	3	0	0	0	0	0	0	0
Black crappie	70	59	0	0	0	0	0	0	0	0
Bluegill	111	64	0	0	0	0	0	0	0	0
Brown bullhead	0	0	0	0	0	0	0	0	57	0
Brown trout	100	0	99	0	0	0	0	0	0	0
Channel catfish	0	0	0	0	0	0	0	0	35	0
Chinook salmon	576	0	585	384	0	0	0	0	0	0
Cisco (Lake herring)	137	0	137	83	0	0	0	0	0	0
Coho salmon	21	0	19	0	0	0	0	0	0	0
Deepwater sculpin	0	0	30	0	0	0	0	0	0	0
Freshwater drum	275	0	336	0	0	0	0	0	0	0
Gizzard shad	24	0	0	0	0	0	0	0	0	0
Lake trout	301	0	300	0	0	0	0	0	0	0
Lake whitefish	365	0	362	356	0	0	0	0	0	0
Largemouth bass	204	0	0	81	0	0	0	0	0	0
Northern pike	117	0	1	0	115	115	1	0	0	0
Pumpkinseed	85	57	0	0	0	0	0	0	0	0
Rainbow smelt	0	0	166	0	0	0	0	0	0	0
Rainbow trout	338	100	37	0	0	0	0	0	0	0
Rock bass	196	0	1	0	0	0	0	0	0	0
Round goby	0	0	8	0	0	0	0	0	0	0
Round whitefish	1	0	1	0	0	0	0	0	0	0
Smallmouth bass	159	157	1	0	0	0	0	0	0	0
Walleye (Yellow pickerel)	664	53	659	456	0	0	0	0	0	0
White bass	257	0	0	0	0	0	0	0	0	0
White perch	346	0	0	0	0	0	0	0	0	0
White sucker	5	0	0	0	0	0	168	0	0	0
Yellow perch	1,270	374	384	250	0	0	0	0	0	0
Total	5,627	864	3,178	1,610	115	115	169	0	92	0

6. Contaminant Monitoring

Lake Ontario Management Unit cooperates annually with several agencies to collect fish samples for contaminant testing. In 2011, 508 contaminant samples were collected for Ontario's Ministry of the Environment Sport Fish Monitoring program (Table 6.1). Samples were primarily collected using existing fisheries assessment programs on Lake Ontario, Bay of Quinte and the St. Lawrence River.

A summary of the number of fish samples collected, by species, for contaminant analysis by the Ministry of Environment, 2001-2011 is shown in Table 6.2.

TABLE 6.1. Number of fish samples collected, by region and species, for contaminant analysis by the Ministry of Environment, 2011.

Region	Block	Species	Total
Upper Bay of Quinte	9	Bluegill	20
		Brown bullhead	41
		Channel catfish	6
		Largemouth bass	20
		Pumpkinseed	20
		Rock bass	20
		Smallmouth bass	16
		Walleye	18
Middle Bay of Quinte	10	Bluegill	20
		Brown bullhead	20
		Channel catfish	9
		Largemouth bass	22
		Pumpkinseed	18
		Rock bass	20
		Smallmouth bass	5
		Walleye	15
Lower Bay of Quinte/Eastern Lake	11	Brown trout	12
		Lake trout	13
		Rock bass	20
		Smallmouth bass	17
		Walleye	18
Thousand Islands	12	Brown bullhead	20
		Largemouth bass	13
		Northern pike	20
		Pumpkinseed	5
		Rock bass	20
		Smallmouth bass	20
		Walleye	20
		Yellow perch	20
			508

TABLE 6.2. Summary of the number of fish samples collected, by species, for contaminant analysis by the Ministry of Environment, 2001-2011.

	Year											
Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Black crappie			20	20	3	20		20		20	29	
Bluegill		26		20	10	23			102	88		40
Brown bullhead		40	44	40	25	30	33	40	68	63	56	81
Brown trout	40	3	20		31		22	6	29	34	34	12
Channel catfish	20	20	7	23		17				8		15
Chinook salmon	40	3	16		48		29	1	36		39	
Coho salmon		1	3									
Common carp				7								
Freshwater drum			43		16		13	2	32	20	37	
Lake trout			42		54		38	17	46	20	33	13
Lake whitefish	20											
Largemouth bass		4	25	28	20	9	8	89	26	40	28	55
Northern pike		53	39	60	22	40	22	94	35	28	31	20
Pumpkinseed		60	25	57	8	11	23	78	92	105	19	43
Rainbow trout	40	37	28	20	37	20	29	20	21	20	33	
Rock bass		36	30	38	11	21	27	30	20	40	42	80
Silver redhorse							1					
Smallmouth bass		20	87	22	21	28	35	23	39	40	31	58
Walleye		42	51	40	61	30	62	98	61	40	70	71
White bass											20	
White perch		40		40	40	14	21	20	35	20	7	
White sucker							1					
Yellow perch	20	60	66	58	75	40	86	90	60	91	80	20
Total	180	445	546	473	482	303	450	628	702	677	589	508

7. Stocking Program

In 2011, OMNR stocked about 2.4 million salmon and trout into Lake Ontario (Table 7.1). Figure 7.1 shows stocking trends in Ontario waters from 1968 to 2011. The New York State Department of Environmental Conservation (NYSDEC) also stocked about 3.8 million salmon and trout into the lake in 2011.

About 580,000 Chinook Salmon spring fingerlings were stocked at various locations to provide put-grow-and-take fishing opportunities. All Chinook Salmon for the Lake Ontario program were produced at Ringwood Fish Culture Station. From 2006 to 2011, this facility was operated by the Ontario Federation of Anglers and Hunters (OFAH), under agreement with OMNR. Volunteers from host club, Metro East Anglers (MEA), provided thousands of hours of technical support at this hatchery. We would like to recognize OFAH, MEA and many other local fishing clubs for their generous and enthusiastic support of the Lake Ontario stocking program.

TABLE 7.1. **Salmon and trout stocked into Province of Ontario waters of Lake Ontario, 2011, and target for 2012.**

		Number Stocked	
Species		**2011***	**2012****
Atlantic Salmon	Eyed eggs	1,075,354	20,000
	Fry	585,008	400,000
	Fall fingerlings	195,475	150,000
	Spring yearlings	93,334	75,000
		1,949,171	**645,000**
Brown Trout	Spring yearlings	**163,314**	**165,000**
Chinook Salmon	Spring fingerlings	**583,240**	**540,000**
Coho Salmon	Fall fingerlings	**76,940**	**0**
Lake Trout	Spring yearlings	501,772	440,000
	Sub-adults	3,304	0
		505,076	**440,000**
Rainbow Trout	Spring yearlings	165,297	140,000
Stocking totals* **		**2,367,684**	**1,930,000**

*includes fish reared and stocked by OMNR and its partners

**OMNR targets only

***excluding eggs

About 90,000 Chinook Salmon were held in pens at eight sites in Lake Ontario for a short period of time prior to stocking. This ongoing project is being done in partnership with local community groups. It is hoped that pen-imprinting will help improve returns of mature adults to these areas in the fall, thereby enhancing local nearshore and shore fishing opportunities.

All Chinook Salmon stocked from 2008 to 2011 were marked with a coded-wire tag and/or an adipose fin clip. This was done using Northwest Marine Technology's AutoFish, a unique, highly automated clipping and tagging system. Marking will help us determine levels of natural reproduction of Chinook Salmon in Lake Ontario and evaluate the effectiveness of our stocking program. The study is being done cooperatively between New York and Ontario. Anglers will continue to see adipose-clipped Chinook Salmon in the fishery in 2012 and beyond. OMNR and NYSDEC will continue to sample marked fish, collect snouts and recover tags from recreational fisheries and other sources. Anglers contributed to the collection of data on marked Chinook Salmon again this year, through a volunteer diary program. Thirty-one diaries were completed, with over 2,400 Chinook Salmon observed. Early results from the marking program show that significant numbers of wild Chinook Salmon are being produced in Lake Ontario streams and these fish are contributing markedly to the boat fishery (Section 3.2).

Atlantic Salmon were stocked in support of an ongoing program to restore self-sustaining populations of this native species to the Lake Ontario basin (Section 8.2). Over 874,000 Atlantic Salmon of various life stages (excluding eggs) were released into current restoration streams in 2011: Credit River, Duffins Creek, Cobourg Brook and the Humber River. OMNR is working cooperatively with the Ontario Federation of Anglers and Hunters and a network of other partners to plan and deliver this phase of Atlantic Salmon restoration, including setting stocking targets to help meet program objectives. Atlantic Salmon are produced at both OMNR and

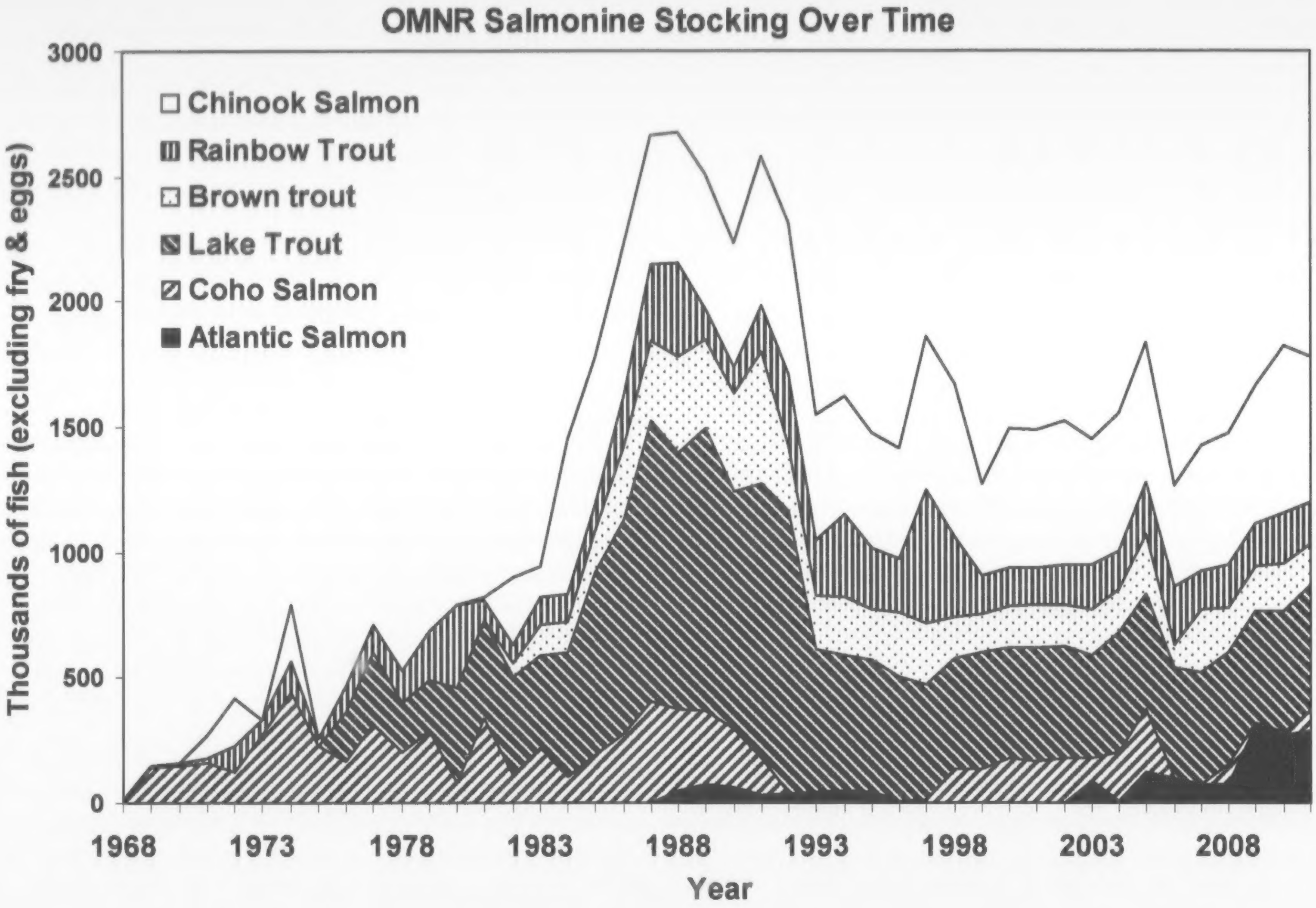

FIG. 7.1. Trends in salmon and trout stocking in Ontario waters of Lake Ontario, 1968-2011.

partner facilities. Three Atlantic Salmon broodstocks, from different source populations in Nova Scotia, Quebec and Maine, are currently housed at OMNR's Harwood Fish Culture Station. Each individual brood fish can be identified by a number stored in a passive integrated transponder (PIT) tag and all have been genotyped to facilitate follow-up assessment on their progeny in the wild.

About half a million Lake Trout yearlings were also stocked as part of an established, long-term rehabilitation program. Lake Trout stocking is focused in eastern Lake Ontario where most of the historic spawning shoals are found. Three strains, originating from Seneca Lake, Slate Islands and Michipicoten Island, are stocked as part of our annual target. In 2011, we stocked an additional 41,000 Lake Trout of Lake Simcoe origin. These fish were surplus to the Lake Simcoe management program. Increasing genetic variation in the Lake Trout population may increase prospects for successful rehabilitation of this native species to Lake Ontario. The Lake Simcoe fish were marked with coded-wire tags so they can be easily identified during follow-up assessment.

Rainbow Trout and Brown Trout were stocked at various locations to provide shore and boat fishing opportunities. A portion of the Rainbow Trout target is stocked into streams with a potential to establish wild populations. About 77,000 Coho Salmon fall fingerlings were produced by stocking partners, Metro East Anglers and the Credit River Anglers Association.

The re-build of OMNR's Normandale Fish Culture Station is well underway and is slated for completion in late 2012. Through state-of-the-art design and equipment, this facility will have the capacity to produce more fish, while reducing the environmental footprint of the station on the surrounding watersheds. Updates include installation of automated feeding, photoperiod control, effluent treatment, water aeration, quarantine and water recirculation systems. Normandale will be the provincial centre for two important Lake Ontario programs: Atlantic Salmon restoration and Chinook Salmon stocking.

OMNR remains committed to providing diverse fisheries in Lake Ontario and its tributaries, based on wild and stocked fish, as appropriate. Salmon and trout fisheries support valued boat, shore, pier and stream fisheries, as well as an active charter industry and a number of world-class fishing derbies. These fisheries contribute significantly to regional and local economies. OMNR is committed also to restoration of native species and supports efforts to maintain / restore healthy, stable Lake Ontario fish communities.

Detailed information about OMNR's 2011 stocking activities is found in Tables 7.2 to 7.7.

TABLE 7.2. Atlantic Salmon stocked in the Province of Ontario waters of Lake Ontario, 2011.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				ATLANTIC SALMON - EYED EGGS				
CREDIT RIVER								
Various sites	1	2010	Harwood	LaHave/Harwood			None	230,908
	2	2010	Harwood	LaHave/Harwood			None	91,013
	12	2011	Harwood	LaHave/Harwood			None	37,698
	12	2011	Harwood	Sebago/Harwood			None	79,511
								439,130
DUFFINS CREEK								
Various sites	1	2010	Harwood	LaHave/Harwood			None	194,213
	1	2010	Harwood	Sebago/Harwood			None	131,405
	12	2011	Harwood	Sebago/Harwood			None	124,238
								449,856
HUMBER RIVER								
Various sites	1	2010	Harwood	LaHave/Harwood			None	69,816
	12	2011	Harwood	Sebago/Harwood			None	116,552
								186,368

Continued on next page

TABLE 7.2 (continued) Atlantic Salmon stocked in the Province of Ontario waters of Lake Ontario, 2011.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
			ATLANTIC SALMON - FRY					
BRONTE CREEK								
Limestone Cr. - Walkers Line	6	2010	Codrington	LaHave/Harwood	6	0.2	None	2,673
	6	2010	Codrington	Sebago/Harwood	6	0.3	None	827
								3,500
COBOURG BROOK								
Ball's Mill	5	2010	Harwood	Sebago/Harwood	4	0.5	None	3,011
	6	2010	Fleming College	LaHave/Harwood	6	1.5	None	14,691
Dale Rd.	5	2010	Normandale	LaHave/Harwood	5	1.2	None	14,999
	5	2010	Normandale	Sebago/Harwood	5	2.3	None	8,937
Hie / McNichol Properties	5	2010	Fleming College	LaHave/Harwood	5	1.4	None	25,581
	6	2010	Harwood	Sebago/Harwood	5	1.2	None	22,276
								89,495
CREDIT RIVER								
Belfountain C.A.	5	2010	Normandale	Sebago/Harwood	5	1.3	None	23,503
Black Cr. - 6th Line	6	2010	Normandale	LaHave/Harwood	6	1.2	None	28,973
Black Cr. - 15th Sideroad	5	2010	Normandale	LaHave/Harwood	5	1.2	None	28,521
Ellie's	5	2010	Normandale	Sebago/Harwood	5	1.3	None	23,455
	6	2010	Normandale	LaHave/Harwood	6	1.7	None	18,916
Forks of the Credit - Dominion St.	5	2010	Normandale	LaHave/Harwood	5	1.2	None	33,505
Forks of the Credit Prov. Park - "meadow"	5	2010	Normandale	Sebago/Harwood	5	1.5	None	23,545
Forks of the Credit Prov. Park - "stuck truck"	5	2010	Normandale	Sebago/Harwood	5	1.3	None	23,474
West Credit R. - Belfountain	4	2010	Belfountain	LaHave/Harwood	N/A	0.2	None	5,731
	5	2010	Belfountain	LaHave/Harwood	N/A	0.2	None	11,000
	5	2010	Belfountain	Sebago/Harwood	N/A	0.2	None	21,718
								242,341
DUFFINS CREEK								
East Duffins Cr. - Claremont Field Centre	5	2010	Normandale	LaHave/Harwood	5	1.2	None	21,730
East Duffins Cr. - Durham Board of Education Outdoor Centre	5	2010	Normandale	LaHave/Harwood	5	1.2	None	20,373
East Duffins Cr. - Greenwood Rd. & Whitevale Rd.	5	2010	Codrington	LaHave/Harwood	5	0.2	None	1,472
	5	2010	Codrington	Sebago/Harwood	5	0.3	None	455
East Duffins Cr. - Michell Cr., 8th Conc.	5	2010	Fleming College	Sebago/Harwood	5	1.9	None	9,954
East Duffins Cr. - Pickering Museum	5	2010	Fleming College	Sebago/Harwood	5	1.9	None	15,767
East Duffins Cr. - Westney Rd. & 8th Conc.	5	2010	Codrington	LaHave/Harwood	5	0.2	None	1,443
	5	2010	Codrington	Sebago/Harwood	5	0.3	None	446
Ganatsekiagon Cr. - Tillings Rd.	5	2010	Fleming College	Sebago/Harwood	5	1.9	None	5,757
West Duffins Cr. - Green River	5	2010	Fleming College	Sebago/Harwood	5	1.8	None	15,761
West Duffins Cr. - Sideline 32	5	2010	Normandale	LaHave/Harwood	5	1.2	None	19,650
West Duffins Cr. - Sideline 34	5	2010	Normandale	LaHave/Harwood	5	1.2	None	10,019
								122,827
HUMBER RIVER								
Albion Hills CA	5	2010	Normandale	Sebago/Harwood	5	2.1	None	5,534
Castlederg Sideroad Bridge (downstream)	5	2010	Fleming College	LaHave/Harwood	5	1.7	None	21,807
Castlederg Sideroad Bridge (upsteam)	5	2010	Fleming College	LaHave/Harwood	5	1.7	None	20,431
Duffy's Lane	5	2010	Normandale	Sebago/Harwood	5	1.7	None	20,534
Highland's Farm	4	2010	Islington Sportsmen's Club	Sebago/Harwood	N/A	0.2	None	6,637

Continued on next page

TABLE 7.2 (continued) Atlantic Salmon stocked in the Province of Ontario waters of Lake Ontario, 2011.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
Humber Station Road	6	2010	Fleming College	LaHave/Harwood	6	1.8	None	17,678
Old Church Road	5	2010	Normandale	Sebago/Harwood	5	2.1	None	15,000
St. Francis Centre	4	2010	Islington Sportsmen's Club	Sebago/Harwood	N/A	0.2	None	19,174
								126,795
OSHAWA CREEK								
Site N/A	6	2010	Pine Valley Springs	Sebago/Harwood		1.0	None	50
			ATLANTIC SALMON - FALL FINGERLINGS					
COBOURG BROOK								
Danforth Rd. Bridge	10	2010	Fleming College	LaHave/Harwood	10	9.9	None	13,476
Division St. Bridge	10	2010	Harwood	Sebago/Harwood	9	10.1	None	9,389
West Branch - Telephone Rd.	10	2010	Fleming College	LaHave/Harwood	10	9.9	None	13,442
								36,307
CREDIT RIVER								
Grange Sideroad	9	2010	Normandale	LaHave/Harwood	9	5.1	None	15,603
	9	2010	Normandale	Sebago/Harwood	9	8.7	None	12,813
Inglewood	9	2010	Normandale	LaHave/Harwood	9	5.5	None	15,644
	9	2010	Normandale	Sebago/Harwood	9	8.7	None	11,363
McLaren Rd.	9	2010	Normandale	LaHave/Harwood	9	5.1	None	16,624
	9	2010	Normandale	Sebago/Harwood	9	8.7	None	14,108
McLaughlin Rd.	9	2010	Normandale	LaHave/Harwood	9	5.5	None	15,617
	9	2010	Normandale	Sebago/Harwood	9	8.7	None	11,384
								113,156
DUFFINS CREEK								
East Duffins Cr. - 5th Conc.	10	2010	Normandale	LaHave/Harwood	9	6.4	None	18,088
	10	2010	Harwood	Sebago/Harwood	9	10.1	None	5,990
West Duffins Cr. - Wixon Cr.	10	2010	Normandale	LaHave/Harwood	9	6.4	None	18,559
								42,637
HUMBER RIVER								
Patterson Sideroad	10	2010	Normandale	LaHave/Mersey	10	14.8	None	3,375
			ATLANTIC SALMON - SPRING YEARLINGS					
COBOURG BROOK								
Danforth Rd. Bridge	3	2009	Normandale	LaHave/Harwood	14	17.9	None	7,196
	3	2009	Fleming College	LaHave/Harwood	15	72.7	None	4,090
Division St. Bridge	6	2009	Harwood	LaHave/Harwood	18	74.0	None	545
Hie / McNichol Properties	3	2009	Fleming College	LaHave/Harwood	16	107.7	None	11,923
								23,754
CREDIT RIVER								
Inglewood	3	2009	Normandale	LaHave/Harwood	14	17.9	None	45,907
Site N/A	N/A	2009	Fleming/CRAA	LaHave/Harwood	N/A	N/A	None	N/A
								45,907
DUFFINS CREEK								
East Duffins Cr. - 5th Conc.	3	2009	Normandale	LaHave/Harwood	14	17.9	None	11,831
East Duffins Cr. - Paulynn Pk	3	2009	Normandale	LaHave/Harwood	14	17.9	None	11,842
								23,673
			ATLANTIC SALMON - SUB-ADULTS					
HUMBER RIVER								
Palgrave - downstream of dam	10	2009	Normandale	Lac St-Jean (wild)	23	126.9	PIT tag	103
Patterson Sideroad	10	2009	Normandale	Lac St-Jean (wild)	23	126.9	None	252
	10	2009	Normandale	Lac St-Jean (wild)	23	126.9	PIT tag	101
								456
TOTAL - ATLANTIC SALMON EYED EGGS								1,075,354
TOTAL - ATLANTIC SALMON FRY								585,008
TOTAL - ATLANTIC SALMON FALL FINGERLINGS								195,475
TOTAL - ATLANTIC SALMON SPRING YEARLINGS								93,334
TOTAL - ATLANTIC SALMON SUB-ADULTS								456
TOTAL - ATLANTIC SALMON								1,949,627

TABLE 7.3. Brown Trout stocked in the Province of Ontario waters of Lake Ontario, 2011.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				BROWN TROUT - SPRING YEARLINGS				
BRONTE CREEK								
Bronte Beach Park	3	2009	Chatsworth	Ganaraska/Tarentorus	14	21.3	RV	**15,038**
DUFFINS CREEK								
401 Bridge	3	2009	Chatsworth	Ganaraska/Tarentorus	14	20.8	RV	**10,121**
LAKE ONTARIO								
Ashbridge's Bay Ramp	3	2009	Chatsworth	Ganaraska/Tarentorus	14	21.3	RV	15,034
Athol Bay	4	2009	Chatsworth	Ganaraska/Tarentorus	15	20.9	RV	7,749
Bluffer's Park	3	2009	Chatsworth	Ganaraska/Tarentorus	14	21.8	RV	14,939
Burlington Canal	3	2009	Chatsworth	Ganaraska/Tarentorus	14	23.4	RV	14,984
Fifty Point CA	3	2009	Chatsworth	Ganaraska/Tarentorus	14	23.4	RV	15,115
Humber Bay Park	3	2009	Chatsworth	Ganaraska/Tarentorus	14	21.3	RV	10,103
Jordan Harbour	3	2009	Chatsworth	Ganaraska/Tarentorus	14	18.4	RV	10,069
Millhaven Wharf	4	2009	Chatsworth	Ganaraska/Tarentorus	15	20.9	RV	15,000
Oshawa Harbour	3	2009	Chatsworth	Ganaraska/Tarentorus	14	20.8	RV	10,121
Port Dalhousie East	3	2009	Chatsworth	Ganaraska/Tarentorus	14	18.4	RV	25,041
								138,155
TOTAL - BROWN TROUT								**163,314**

TABLE 7.4. Chinook Salmon stocked in the Province of Ontario waters of Lake Ontario, 2011.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				CHINOOK - SPRING FINGERLINGS**				
BOWMANVILLE CREEK								
CLOCA Ramp	4	2010	Ringwood	Wild - Credit R.	4	4.1	Ad/CWT	20,423
	6	2010	Ringwood	Wild - Credit R.	6	9.4	Ad/CWT	486
Port Darlington	5	2010	Ringwood*	Wild - Credit R.	5	8.2	Ad	10,007
								30,916
BRONTE CREEK								
2nd Side Road Bridge	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad	16,528
	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad/CWT	10,459
5th Side Road Bridge	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad	16,529
	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad/CWT	10,006
	6	2010	Ringwood	Wild - Credit R.	6	7.0	Ad/CWT	452
								53,974
CREDIT RIVER								
Norval	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad	77,993
	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad/CWT	20,732
	6	2010	Ringwood	Wild - Credit R.	6	8.2	Ad/CWT	477
								99,202
DON RIVER								
Donalda Golf Club	5	2010	Ringwood	Wild - Credit R.	5	6.4	Ad	**19,882**
HIGHLAND CREEK								
Colonel Danforth Park	5	2010	Ringwood	Wild - Credit R.	5	6.4	Ad	**15,000**
HUMBER RIVER								
East Branch Islington	5	2010	Ringwood	Wild - Credit R.	5	6.4	Ad	**15,000**
LAKE ONTARIO								
Ashbridge's Bay Ramp	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad	10,000
Beacon Inn	4	2010	Ringwood	Wild - Credit R.	4	3.9	Ad	25,000
Brighton	5	2010	Ringwood	Wild - Credit R.	5	6.2	Ad	5,014
Bluffer's Park	4	2010	Ringwood	Wild - Credit R.	4	4.3	Ad	6,186
	4	2010	Ringwood	Wild - Credit R.	4	4.3	Ad/CWT	20,688
	5	2010	Ringwood*	Wild - Credit R.	5	10.2	Ad	10,006
	6	2010	Ringwood	Wild - Credit R.	6	8.3	Ad/CWT	496
Burlington Canal	4	2010	Ringwood	Wild - Credit R.	4	3.8	Ad	30,607
	4	2010	Ringwood	Wild - Credit R.	4	3.8	Ad/CWT	20,085
	6	2010	Ringwood	Wild - Credit R.	6	5.6	Ad/CWT	459
Consecon Robinson Pt	4	2010	Ringwood	Wild - Credit R.	4	4.0	Ad	15,000
Lakeport	4	2010	Ringwood	Wild - Credit R.	4	4.0	Ad	20,141
Oshawa Harbour	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad	15,374
	5	2010	Ringwood*	Wild - Credit R.	5	7.2	Ad	4,688
Port Dalhousie East	4	2010	Ringwood	Wild - Credit R.	4	3.8	Ad	49,703
	4	2010	Ringwood	Wild - Credit R.	4	3.8	Ad/CWT	20,212
	5	2010	Ringwood*	Wild - Credit R.	5	7.5	Ad	30,634
	6	2010	Ringwood	Wild - Credit R.	6	8.0	Ad/CWT	467
Port Credit Marina	5	2010	Ringwood*	Wild - Credit R.	5	7.5	Ad	4,909
Wellington Channel	4	2010	Ringwood	Wild - Credit R.	4	4.0	Ad	15,000
	5	2010	Ringwood*	Wild - Credit R.	5	6.1	Ad	12,359
Whitby Harbour	4	2010	Ringwood	Wild - Credit R.	4	4.2	Ad	19,759
	5	2010	Ringwood*	Wild - Credit R.	5	7.4	Ad	12,479
								349,266
TOTAL - CHINOOK SALMON								**583,240**

* Pen-imprinted

**All fish produced at Ringwood FCS by the Ontario Federation of Anglers and Hunters and volunteers from Metro East Anglers

TABLE 7.5. Coho salmon stocked in the Province of Ontario waters of Lake Ontario, 2011.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				COHO - FALL FINGERLINGS				
CREDIT RIVER								
Norval - Nashville North	10	2010	Ringwood*	Credit R. (wild)	10	22.5	None	68,000
	10	2010	CRAAH*	Credit R. (wild)	10	22.5	None	8,940
TOTAL - COHO SALMON								**76,940**

* following the hatchery name indicates a partnership hatchery

Ringwood - all fish at Ringwood FCS were produced by the Ontario Federation of Anglers and Hunters and volunteers from Metro East Anglers

CRAAH - Credit River Anglers Association Hatchery

TABLE 7.6. Lake Trout stocked in the Province of Ontario waters of Lake Ontario, 2011.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				LAKE TROUT - SPRING YEARLINGS				
LAKE ONTARIO								
Cobourg Harbour Pier	4	2009	Harwood	Seneca Lake/Tarentorus	16	26.9	AdRV	19,333
	5	2009	Harwood	Seneca Lake/Tarentorus	17	35.0	AdRV	22,833
Fifty Point CA	4	2009	Harwood	Seneca Lake/Tarentorus	16	27.9	AdRV	53,557
	4	2009	Harwood	Slate Islands/Dorion	16	30.5	AdRV	11,955
	5	2009	Harwood	Seneca Lake/Tarentorus	17	32.8	AdRV	13,164
	5	2009	Harwood	Slate Islands/Dorion	17	34.4	AdRV	6,234
	5	2009	Chatsworth	Lake Simcoe (Wild)	17	34.0	Ad/CWT	41,229
North of Main Duck Sill	4	2009	Harwood	Seneca Lake/Tarentorus	16	28.5	AdRV	13,472
	4	2009	White Lake	Slate Islands/Dorion	17	25.0	AdRV	47,265
	4	2009	Harwood	Slate Islands/Dorion	16	35.0	AdRV	5,922
	4	2009	Harwood	Michipicoten Island/Dorion	17	32.9	AdRV	60,811
South of Long Point	4	2009	White Lake	Seneca Lake/Tarentorus	15	29.1	AdRV	154,387
	4	2009	White Lake	Slate Islands/Dorion	17	25.0	AdRV	51,610
								501,772
				LAKE TROUT - SUB-ADULTS				
LAKE ONTARIO								
Fifty Point CA	11	2009	Chatsworth	Michipicoten Island (Wild)	22	224.4	Ad/CWT	3,304
TOTAL - LAKE TROUT SPRING YEARLINGS								**501,772**
TOTAL - LAKE TROUT SUB-ADULTS								**3,304**
TOTAL - LAKE TROUT								**505,076**

TABLE 7.7. Rainbow Trout stocked in the Province of Ontario waters of Lake Ontario, 2011.

SITE NAME	MONTH STOCKED	YEAR SPAWNED	HATCHERY	STRAIN/ EGG SOURCE	AGE (MONTHS)	MEAN WT (G)	MARKS	NUMBER STOCKED
				RAINBOW TROUT - SPRING YEARLINGS				
BRONTE CREEK								
2nd Side Road Bridge	4	2010	Normandale	Ganaraska/Tarentorus	12	14.5	AdRV	12,038
4th Side Road Bridge	4	2010	Normandale	Ganaraska/Tarentorus	12	14.5	AdRV	12,020
								24,058
CREDIT RIVER								
Huttonville	4	2010	Normandale	Ganaraska/Tarentorus	12	16.8	AdRV	12,003
Norval - Nashville North	4	2010	Normandale	Ganaraska/Tarentorus	12	17.4	AdRV	12,043
Site N/A	N/A	2010	CRAAH*	Credit River (wild)	N/A	NA/	N/A	N/A
								24,046
HUMBER RIVER								
East Branch Islington	4	2010	Normandale	Ganaraska/Tarentorus	12	15.2	AdRV	16,025
King Vaughan Line	4	2010	Normandale	Ganaraska/Tarentorus	12	14.0	AdRV	16,055
								32,080
LAKE ONTARIO								
Glenora	5	2010	Harwood	Ganaraska/Tarentorus	14	29.5	AdRV	4,005
Jordan Harbour	4	2010	Normandale	Ganaraska/Tarentorus	12	14.5	AdRV	20,055
Millhaven Wharf	5	2010	Harwood	Ganaraska/Tarentorus	14	29.5	AdRV	6,804
Port Dalhousie East	4	2010	Normandale	Ganaraska/Tarentorus	12	15.2	AdRV	31,479
Waupoos	5	2010	Harwood	Ganaraska/Tarentorus	14	29.5	AdRV	7,245
								69,588
ROUGE RIVER								
Little Rouge at Steeles	3	2010	Ringwood*	Rouge River (wild) Ganaraska/Tarentorus	10	20.6	None	**15,525**
TOTAL - RAINBOW TROUT								**165,297**

* following the hatchery name indicates a partnership hatchery

CRAAH - Credit River Anglers Association Hatchery

Ringwood - all fish at Ringwood FCS were produced by the Ontario Federation of Anglers and Hunters and volunteers from Metro East Anglers

8. Biodiversity and Species Rehabilitation

8.1. Introduction

OMNR works with many partners – government agencies, non-government organizations and interested individuals at local, provincial and national levels – to monitor, protect and restore the biological diversity of fish species in the Lake Ontario basin (including the lower Niagara River and the St. Lawrence River downstream to the Quebec-Ontario boarder). Native species restoration is the center piece of LOMU's efforts to restore the biodiversity.

A number of fish species have been lost or persist in low numbers in the Lake Ontario basin. Table 8.1.1 lists twenty-three fish species that formerly occurred or are currently 'rare' in the Lake Ontario basin. The Blackfin Cisco (note that there is debate about historic existence of Blackfin Cisco in Lake Ontario), the Lake Ontario Kiyi, Atlantic Salmon and Blue Pike (a sub-species of walleye) are thought to be extinct. Three species, Lake Trout, Bloater, and Shortnose Cisco have been extirpated from the Lake Ontario basin. Four species, American Eel, Burbot, Deepwater Sculpin and Lake Sturgeon that were once very common in the basin are now considered to be rare. The remaining species on this list were either uncommon historically or their historic status is uncertain. In addition, we acknowledge that there may be other species (small cyprinids for example) that may have been present historically but were lost prior to their documentation of their presence in the basin.

The sections following describe the planning and efforts to restore Atlantic Salmon and American Eel, Lake Trout, deepwater ciscoes, and Round Whitefish. Success restoring these native species would be a significant milestone in improving Ontario's biodiversity. In addition, efforts to manage and monitor Round goby and Chain Pickerel are described. Observations of rare fish species, other than those covered in detail below, in the Lake Ontario and its tributaries during 2011 included:

Deepwater Sculpin: 30 specimens captured in Lake Ontario south of Rocky Point, see Section 2.2;

Round Whitefish: 1 specimen captured in Lake Ontario near Cobourg, see Section 2.2.

8.2 Atlantic Salmon Restoration

Atlantic Salmon were extirpated from Lake Ontario by the late 1800s, primarily as a result of the loss of spawning and nursery habitat in streams. As a top predator, they played a key ecological role in the offshore fish community. They were a valued resource for aboriginal communities and early Ontario settlers. As such, Atlantic Salmon are recognized as an important part Ontario's natural and cultural heritage.

A unique partnership has been established to help bring back wild, self-sustaining populations of Atlantic Salmon to Lake Ontario. This partnership, launched in 2006, brings together the Ministry of Natural Resources and the Ontario Federation of Anglers and Hunters (O.F.A.H.) and a strong network of partners and sponsors. Program partners recognize the generous support of Phase I lead sponsor, Australia's Banrock Station Wines, and welcome Phase II lead sponsor, Ontario Power Generation. Many other sponsors, conservation organizations, corporations, community groups and individuals are contributing to the success of this program.

Funding and in-kind support from all partners have contributed to enhanced fish production, habitat rehabilitation and stewardship initiatives, a research and assessment program and public education and outreach activities.

Restoration efforts have been focused on three "best-bet" streams – the Credit River, Duffins Creek and Cobourg Brook. More recently, the Humber River has been added to the program.

TABLE 8.1.1. Status of 'rare' fishes in the Lake Ontario basin and their designation (as of February 24, 2012) under the Ontario Endangered Species Act (ESA) and the Canadian Species at Risk Act (SARA).

Name	**Status in Lake Ontario Basin**	**Species at Risk in Ontario List Designation**	**SARA Designation**
American Eel, *Anguilla rostrata*	Historically very abundant throughout the nearshore zone of the basin; now rare.	Endangered	No Status - proposed as Special Concern Pending public consultation
Atlantic Salmon (Lake Ontario population), *Salmo salar*	Historically abundant throughout Lake Ontario and major tributaries; Extirpated prior to 1900's; restoration efforts underway.		No Status - Extinct
Bigmouth Buffalo, *Ictiobus cyprinellus*	Rare historic observations; one recent observation in Lake Ontario.		Not at Risk
Black Redhorse, *Moxostoma duquesnei*	Historic abundance unclear; currently found at low abundance in Spencer Creek.	Threatened	No Status, - proposed as Threatened, pending public consultation
Blackfin cisco, *Coregonus nigripinnis*	Historically abundance in offshore pelagic zone is unclear; thought to have become extinct by 1900.		Threatened
Bloater, *Coregonus hoyi*	Historically abundant in offshore pelagic zone; extirpated; last recorded in 1983.		Not at Risk
Blue Pike, *Sander vitreus glaucus*	Historically abundant in western Lake Ontario and Niagara River; extinct prior to 1970's.		No Status - Extinct
Bridle Shiner, *Notropis bifrenatus*	Historic abundance unclear; Currently at low abundance in upper St. Lawrence River and tributaries, as well as Napanee River and Bay of Quinte	Special Concern	Special Concern
Burbot, *Lota lota*	Abundant in the offshore benthic zone up to the 1920; declined steadily to virtual extirpation by about 1950; now rare.		
Channel Darter, *Percina copelandi*	Historic abundance unclear but occurred in the upper St. Lawrence River; currently found at low abundance in Moira River (including the Skootamatta River) and Salmon River.	Threatened	Threatened
Cutlip Minnow, *Exoglossum maxillingua*	Historic abundance unclear; Currently at low abundance in St. Lawrence River and tributaries.	Threatened	Not at Risk
Deepwater Sculpin (Great Lakes population), *Myoxocephalus thompsonii*	Historically very abundant in offshore benthic zone; currently rare but increasing		Threatened
Grass Pickerel, *Esox americanus vermiculatus*	Historic abundance unclear; currently in low abundance in St. Lawrence River, Bay of Quinte, Lake Consecon, Wellers Bay.	Special Concern	Special Concern
Lake Chubsucker, *Erimyzon sucetta*	Present in wetlands that drain into the lower Niagara River. Not observed until 1949, may always have been rare.	Threatened	Endangered
Lake Ontario Kiyi, *Coregonus kiyi orientalis*	Historically abundant in offshore pelagic zone; extinct; last recorded in 1964.		No Status - Extinct
Lake Sturgeon (Great Lakes and Western St. Lawrence populations), *Acipenser fulvescens*	Common in the nearshore zone and large tributaries throughout the basin prior to 1900; now rare.	Threatened	No Status - proposed as Threatened pending public consultation
Lake trout, *Salvelinus namaycush*	The most abundant piscivore in the offshore zone up to the 1920s; declined steadily to virtual extirpation by about 1950; Restoration efforts underway.		
Pugnose Shiner, *Notropis anogenus*	Historic abundance is unclear; currently at low abundance in Thousand Islands area of St. Lawrence River.	Endangered	Endangered
Redside Dace, *Clinostomus elongatus*	Historic abundance unclear, but occurred in tributaries from Oshawa to Hamilton; currently rare.	Endangered	Special Concern – proposed as Endangered pending public consultation
River Redhorse, *Moxostoma carinatum*	Historic abundance unclear; currently at low abundance in Bay of Quinte and Trent River.	Special Concern	Special Concern
Shortnose Cisco, *Coregonus reighardi*	Historically abundant in offshore pelagic zone; extirpated; last recorded in 1964.	Endangered	Endangered
Silver Shiner, *Notropis photogenis*	Historic abundance unclear; currently at low abundance in Bronte Creek.	Special Concern	Special Concern – proposed as Threatened pending public consultation
Spotted Gar, *Lepisosteus oculatus*	Limited historic abundance in sheltered nearshore zone; two recent observations in Bay of Quinte and East Lake (possible un-authorized introductions)	Threatened	Threatened

These systems offer good quality spawning and nursery habitat for Atlantic Salmon and community support is strong. Demonstrated success in these systems will pave the way for restoration of Atlantic Salmon to other suitable streams in future phases of the program.

Three broodstocks from different source populations in Nova Scotia, Quebec and Maine have been established and are currently housed at OMNR's Harwood Fish Culture Station. Production stocking of our new Sebago Lake (Maine) broodstock began in 2011. We expect to stock the first progeny from the new Lac St-Jean (Quebec) broodstock in 2012. The performance of all three strains will be evaluated in the Lake Ontario environment.

We have designed a long-term study to compare the effectiveness of stocking spring fingerlings, fall fingerlings and spring yearlings for the purpose of restoration. Genetic profiles have been developed for each individual brood fish in the hatchery to help us track their progeny in the streams and in the lake.

More than 3.5 million Atlantic Salmon, of various life stages (excluding eggs), have been stocked by OMNR and various partner hatcheries since the program began. Sizable numbers of returns of adults to the Credit River have been observed from 2008 through 2011. Measures continue to be taken to improve access to upstream spawning habitat through the removal or modification of barriers and installation of fishways. The completion of a fishway at Norval was a notable milestone in 2011. This fishway has a built-in trap which allows us to enumerate adult Atlantic Salmon (and other species) as they migrate upstream, as well as collect important biological data on individual fish (Section 2.10). We recently received approval from the Great Lakes Fishery Commission to proceed with a 3-year proposal to install and operate a resistance board weir on Duffins Creek. This specialized piece of fishing gear, never before tested on the Great Lakes, will allow us to more effectively monitor adult returns to this restoration stream.

Monitoring of juveniles in the streams has been done to assess growth and survival of stocked fish, estimate smolt production (by life stage stocked), document timing of downstream migration and describe the environmental cues which trigger this downstream movement (Sections 2.8 and 2.9).

Thousands of students from schools and outdoor education centres have participated in a classroom hatchery program designed to actively involve youth in local restoration efforts. And, thousands of staff, partner and volunteer hours have been logged on more than 100 stream habitat protection and enhancement projects.

Although the presence of Atlantic Salmon in the Lake Ontario boat fishery remains low, catch rates over the past several years have rivalled any previously observed by New York State, in more than 25 years of data collection (J. Lantry, pers. comm.). 2011 produced the second highest Atlantic Salmon catch rate on record. The number of staging Atlantic Salmon encountered by pier anglers at the mouth of the Credit River appears to be increasing. Angler interest in Atlantic Salmon is growing and responses to the experience of catching an Atlantic Salmon have generally been very positive.

To find out more about the program, meet our partners and discover volunteer opportunities, please visit http://www.bringbackthesalmon.ca/.

8.3 American Eel Restoration

American Eel is identified as an Endangered species under Ontario's Endangered Species Act (ESA). In addition, the Committee on the Status of Endangered Wildlife in Canada recommended that American Eel be identified as a species of Special Concern under the Canadian Species at Risk Act. These designations have lead to additional efforts to protect American Eel in Ontario. Several actions were taken by MNR's partners and the Lake Ontario Management Unit during 2011 to address the low abundance of eel.

MNR and Ontario Power Generation (OPG) have collaborated on the operation of the eel ladder at the R.H. Saunders Hydroelectric Dam since 1974. The Saunders eel ladder was opened on Jun 15 and closed on Oct 15, 2011 (122 days) and total of 11,624 eels successfully exited the eel passage facility (Fig. 8.3.1). During 2009, OPG made major modifications to the Saunders eel ladder. Adjustments required to optimize the operation of the modified ladder may have contributed to the low number and size of eels during 2009 and 2010, however the numbers of eels climbing the ladder on the Moses portion of the dam (operated by the New York Power Authority) should also be considered.

The number of small yellow eels moving up the Moses ladder during 2011 was 39,576, which is the highest number recorded since this ladder opened during 2006. Combined, 51,200 eels passed the two ladders located at the Moses-Saunders Dam during 2011. This number was the largest observed since 1994 (163,518 eels), and continues the general trend of increasing numbers since 2001. However, the numbers migrating upstream last year are still less than 8% of the numbers of eel observed during the early years of the ladder's operation (Fig. 8.3.1, over 600,000 eels per year during the 1970s and 1980s).

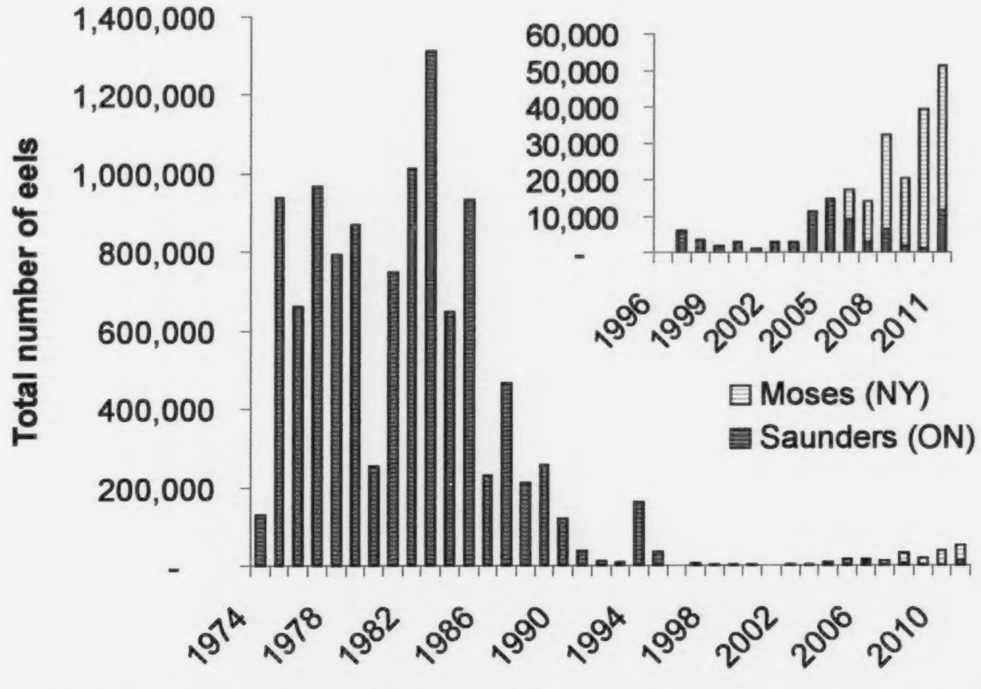

FIG. 8.3.1. Total number of eels ascending the eel ladder(s) at the Moses-Saunders Dam, Cornwall, Ontario for 1974-2011. No counts are available for 1996.

The abundance of larger 'yellow' eels in the upper St. Lawrence River (USLR) and eastern Lake Ontario (ELO) was measured with three assessment programs during 2011. Bottom trawling in the Bay of Quinte has been conducted since 1972 as part of the fish community index program (see Section 2.3). The average catch of American Eel in 372 trawls conducted between 1972 and 1996 was 1.68 eels per trawl; however, no eels were captured in the 468 trawls conducted between 2003 and 2011. Nearshore trapnetting was conducted in the upper Bay of Quinte and the lower Bay of Quinte using the NSCIN fish community index protocol during 2011 (see Section 2.4). Five eel were captured in the total of 72 net sets.

Quantitative electrofishing was conducted during 2011 in the Mallorytown area (USLR) and Main Duck Island - Yorkshire Bar area (ELO) by Dr. J. Casselman and L. Marcogliese of Queens University. Eel abundance in the USLR was 11.596 ± 7.311 eels/hr during night-time surveys while in the ELO, 0.536 ± 0.636 eels/hr were captured during night-time surveys (Fig. 8.3.2). Based on the size of eels captured and examination of eel otoliths for fluorescent marks (which identify stocked eels), it appears that all of the fish observed at both locations during 2011 originated from stocking programs. One hundred eels captured at the Mallorytown site were examined and three individual each had a single *Anguillicoloides crassus* parasite in its swimbladder. This parasite has never been identified in eels from the USLR – ELO. It is not known if the parasite has an impact on the American Eels overall survival, however scientists suspect that the reproductive output of eels with large infestations of the parasite may be negatively affected.

Lake Ontario Management Unit staff assisted OPG and Fisheries and Oceans Canada in the implement the OPG Action Plan to improve eel abundance in ELO and USLR and improve passage of eel around hydroelectric generating facilities in the St. Lawrence River. In one component of the OPG plan, staff assisted in health assessment and stocking of over 4 million glass eel into the USLR and ELO during 2006 to 2010 (see Section 7.1). All stocked eels were purchased from commercial fisheries in Nova Scotia and were marked with a fluorescent dye to distinguish them from naturally migrating eels.

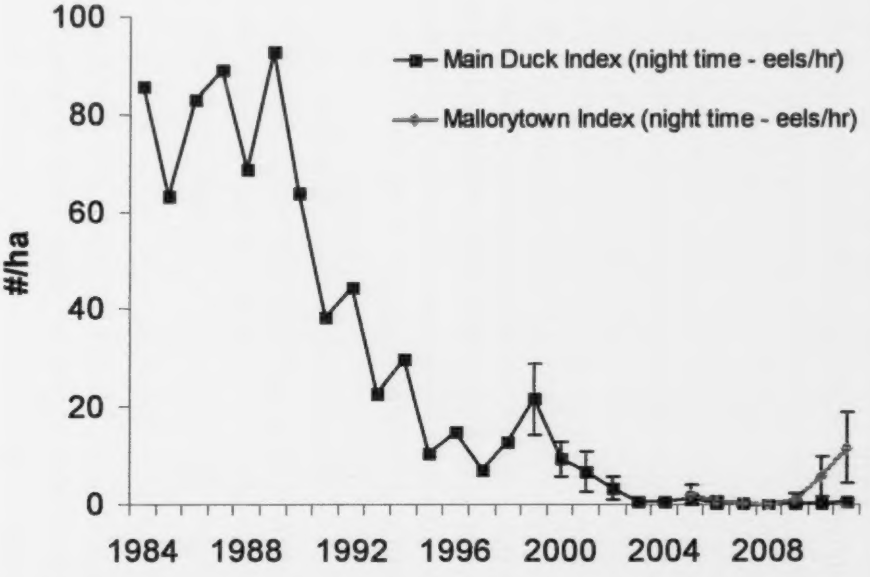

FIG. 8.3.2. Numbers of eel caught in the vicinity of Main Duck Island in eastern Lake Ontario and Mallorytown Landing in the upper St. Lawrence River per hour of night electrofishing (Casselman and Marcogliese, 2011).

Prior to all stocking, health screening was conducted at the Atlantic Veterinary College, and the testing results for a wide variety of fish pathogens (including *Anguillicoloides crassus*) were all negative for stocked fish. As prescribed in the American Eel Action Plan – eels were not stocked during 2011 and plans to stock them in the future are under review. It is not known at this time how the presence of *A. crassus* in Lake Ontario will impact the broader restoration efforts of American Eel in Ontario. Although there was no eel stocking during 2011, initial results suggest that eels stocked in previous years are surviving well, growing quickly, and dispersing widely from stocking sites. Some stocked eels are maturing into males and migrating at a small size; this has not been observed before.

In a second component of the OPG Action Plan, MNR staff assisted in the capture, tagging and transport of large yellow eels from the USLR, ELO and Lake St. Francis (LSF) to Lac St. Louis (a section of the St. Lawrence River below all barriers to downstream migration). This study is a continuation of the project conducted in 2008, 2009 and 2010 which was undertaken by OPG as a pilot project to investigate the economics and practical feasibility of this alternative for mitigating turbine mortality at the Saunders GS during the downstream migration of mature silver eels. The project also involved local commercial fish harvesters, Akwesasne First Nation and Quebec MRNF.

A total of 252 large eels (minimum size > 80 cm or approximately 2.5 lb) were taken by 11 license holders from mid April-Jun 20 as a by-catch in the existing spring hoop and trap net fisheries in USLR and ELO (upstream of the Moses-Saunders Dam). The LSF fish harvesters (2 licences) also participated in the spring fishery and captured 1,475 eels. Eels from USLR-ELO were transported to holding facilities at the MNR's Glenora Research Station. In the case of eels from LSF, eels were transferred to a facility at Bainsville, Ontario. At both locations a passive integrated transponder (PIT) tag was implanted in each eel for subsequent identification and morphometric data were collected.

In 2011, a total of 1622 large yellow eels from LSF and the USLR-LO were released in Lac St. Louis immediately downstream of the Beauharnois GS. Another 105 eels collected from LSF were returned to LSF as a reference sample. During the release program, all the eels were observed to be in good health. The mortality rate during capture and holding was 1.1%.

To monitor the long-term survival, condition, maturation and migration of the transported yellow eels, biologists from Quebec MRNF attempted to recover tagged eels in the silver eel fishery in the St. Lawrence River estuary. During the fall of 2011, 79 PIT tags from the OPG trap and transport study were detected and another 116 PIT tags came from previous studies conducted near Moses-Saunders GSs from 1997 to 2001. The recaptured transported eels included one from 2008; four from 2009; nine from 2010 and forty seven from 2011. The number of reference eels recaptured included; five from 2009; ten from 2010 and one from 2011. While full results of the work are not available at this time, preliminary results found that transported eels appear to migrate at higher rate in the first year than reference eels. However, two years after their release more reference eels left the system and the percentage of reference vs. transported eels migrating from the trap and transport program was similar.

The 2011 trap and transport project continued to demonstrate that, where abundant, large yellow eels can be caught, held for brief periods, and transported successfully with limited mortality. Transported eels can be detected in the estuarial fishery. Lastly it appears that transported eels migrate at higher rate in the year of tagging when compared to reference eels. However, two years after their release the percentage of reference vs. transported eels migrating through the St. Lawrence Estuary from the trap and transport program was similar.

8.4 Lake Trout Restoration

Lake Trout were extirpated in Lake Ontario in the 1950s. The loss of this top predator and valued commercial species caused both ecological and economic damage. Rehabilitation of Lake Trout in Lake Ontario began in the 1970s with Sea Lamprey control, and stocking of hatchery fish. The first joint Canada/U.S. plan outlining the objectives and strategies for the rehabilitation efforts was formulated in 1983, and revisions in 1990 and 1997 were made to evaluate the methodology and the progress of rehabilitation. A new revision of the plan is in final stages of completion. It reaffirms the core strategies of stocking and protection of stocked fish (Sea Lamprey and harvest control), but it also identifies the reduced survival of stocked juveniles as a key issue to be addressed. Ecosystem impediments to restoration, and strategies to mitigate them are also discussed.

Natural reproduction of Lake Trout in Lake Ontario continues at low but steady levels. Natural reproduction can be gauged by the occurrence of fish without hatchery marks (clipped adipose fin), and refined through stable isotope analysis of otoliths to discount hatchery fish that were either not marked or whose adipose clips have regenerated. The number of unmarked Lake Trout caught in the gillnet index program (Section 2.2) has increased slightly since year 2000, just as the total numbers of captured Lake Trout have decreased. Averaged over the period 2003-2008, unmarked fish made up 12.5% of the total catch (Fig. 8.4.1). The proportion of actual wild fish among the unmarked fish was 90.8% (stable isotope analysis, 2003-2008 average), suggesting that over this period wild fish made up 11.3% of the population at large. Since then the proportion of unmarked Lake Trout has decreased to 5.7 % (2009-2011 average). The otoliths from this period remain to be examined, but assuming the previously estimated proportion of wild fish among the unmarked, the average 2009-2011 proportion of wild fish at large would have decreased to 5.2%.

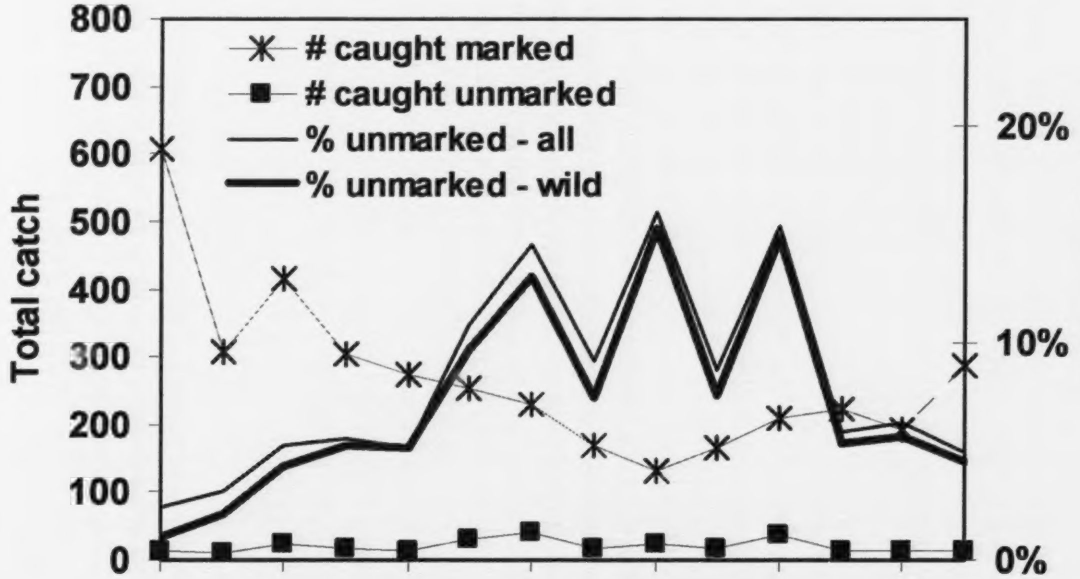

FIG. 8.4.1.Catches of marked and unmarked and wild Lake Trout in the eastern Lake Ontario index gillnet program.

8.5 Deepwater Cisco Restoration

Until the mid 1950's, Lake Ontario was home to a very diverse assemblage of deepwater ciscoes including Bloater (*Coregonus hoyi*), Kiyi (*C. kiyi*), Shortnose Cisco (*C. reighardi*) and possibly Blackfin Cisco (*C. nigripinnis*). Currently, only the shallow-water form of Cisco (*C. artedi*) remains in Lake Ontario. The Lake Ontario Committee's goal is to establish a self-sustaining population of deepwater cisco in Lake Ontario within 25 years. Objectives and associated strategies are specified in a draft strategic plan currently under review. The plan addresses sources of gametes, culture facilities, culture capacity, stocking targets, detection of wild fish, increasing our understanding of ecological consequences, research needs, and public education. Potential benefits of restoring deepwater cisco include increasing the diversity and resilience of the food web, increasing wild production of salmon and trout by reducing thiaminase impacts of a diet based on Alewife and Rainbow Smelt, supporting a small commercial fishery, restoring historical food web structures and function and increasing trophic transfer efficiency. Potential risks relate to the unpredictability of food web interactions in an evolving Lake Ontario ecosystem. Accepting some risk and uncertainty, doing the necessary science to increase understanding and minimize risk, and adapting management strategies accordingly are prerequisites for successful restoration of deepwater cisco in Lake Ontario.

Consistent with the plan, efforts continued in 2011 to seek sources of gametes, learn more about culture methods, and continue genetic research. During January and February of 2012, fertilized Bloater eggs were obtained from Lake Michigan with the help of local commercial fisherman and personnel from the US Fish and Wildlife Service. Eggs were transferred to quarantined facilities at the Ontario Ministry of Natural Resources, White Lake Fish Culture Station and the US Geological Survey Laboratory at Tunison, New York. The Tunison laboratory received four lots of eggs (27,000 total). Eggs are apparently surviving well and approximately 43% of the most advanced batch successfully reached the eyed-egg development stage. White Lake received approximately 350,000 eggs in several batches over the winter months. Egg batches are in different stages of development but are surviving well with an estimated 42% reaching the eyed-egg development stage. It is anticipated that approximately 100,000 fry could survive to the fall at White Lake. Also, at White Lake 250 juveniles have survived from the 2010/2011 collections (Fig. 8.5.1) and are surviving very well on artificial feed.

FIG. 8.5.1. Deepwater cisco (age approx. 11-months) at the White Lake Fish Culture Station, 2011.

Photo credit Glenn Hooper

8.6 Round Whitefish Action Plan

Since the spring of 2010, LOMU has worked with OPG, DFO, EC and the Central Lake Ontario Conservation Authority to better understand the potential impact of the Darlington New Nuclear project on the aquatic ecosystem and explore mitigation and compensation options.

Round Whitefish are primarily found along the north-central shore of Lake Ontario. They appear to have spawning locations associated with headlands in this area, including Raby Head, which is within the study area and subject to proposed lake in-filling. The fish spawning at Raby Head may be very important to the round whitefish population(s) lake-wide which appear to be suffering from poor recruitment at all locations sampled.

In 2011, OPG conducted further fisheries assessment. The results of the fall assessment support LOMU's concern that the area around Darlington may be significant for Round Whitefish. However, since little is known about this species, determining effective mitigation and appropriate compensation options for habitat loss due to lake infilling, thermal changes and water intake is difficult. Therefore, OPG, MNR and DFO proposed a draft Round Whitefish Action Plan that should provide a long-term framework for assessment and potential management actions.

8.7 Non-native Species Update—Round Goby and Chain Pickerel

Round Goby

Round Goby invaded western Lake Ontario in 1998, were first reported in the Bay of Quinte in 1999, and were first captured in routine Bay of Quinte assessment bottom trawls in 2001 and gillnets in 2002. Goby distribution expanded to include all areas of eastern Lake Ontario and the Bay of Quinte to depths of at least 36 m by 2006.

Round Goby abundance was high in offshore areas of the Bay of Quinte by 2003, declined rapidly after 2004 in gillnet catches but stabilized at relatively high levels in the bottom trawls (see Sections 2.2 and 2.3). Only the largest Round Goby are vulnerable to the gill net gear. After 2004, the goby size structure included primarily smaller individuals; so the gillnets may not provide a reliable indicator of abundance. Round Goby appeared in the diet of many piscivores in the Bay of Quinte in 2003.

In Lake Ontario, goby abundance increased until about 2006 and then declined somewhat (Sections 2.2 and 2.3).

Chain Pickerel

The Chain Pickerel (*Esox niger*) is a small to medium-sized member of the pike family (Esocidae). The species prefers warm water, usually inhabits sluggish streams and heavily vegetated lakes, and is a top predator in the fish community. Its native range is primarily the Atlantic coastal plain on the east side of the Allegheny-Appalachian Mountains in the eastern United States. Introductions and range expansions have resulted in a distribution that now extends west of the Allegheny-Appalachian Mountains. The Canadian distribution of Chain Pickerel includes Quebec (south of the St. Lawrence River and east of Montreal), southern New Brunswick and Nova Scotia. Their status is Not At Risk in Canada. The species is not native to New Brunswick or Nova Scotia and its native status in Quebec is uncertain.

The first Chain Pickerel collected in Ontario and the first on the northwest side of the St. Lawrence River in Canada was caught by a local commercial fisherman in April 2008. Since 2008, five additional specimens were caught: three in 2009, three more in 2010, and nine in 2011. All were captured in the eastern Lake Ontario and Thousand Islands area of the St. Lawrence River. All individuals were mature adults in robust condition. The appearance of Chain Pickerel in these Ontario waters may signal a range expansion of this species from New York State waters where the species appears to have increased in abundance in recent years. While not yet a major species locally, the potential future impact of this species on the nearshore ecosystem is not known.

For further reading see:
*Hoyle, James A., and Colin Lake. 2011. First occurrence of Chain Pickerel (*Esox niger*) in Ontario: possible range expansion from New York waters of eastern Lake Ontario. Canadian Field-Naturalist 125 (1): 16–21.*

http://www.canadianfieldnaturalist.ca/index.php/cfn/article/view/1116

9. Management Planning

9.1 Fisheries Management Zone 20 Council (FMZ20)

The Zone 20 Fisheries Advisory Council provides recommendations to the Lake Ontario Manager regarding the recreational fishery. The two sub-councils (Eastern and Western) met six times in 2011.

The Zone 20 council played a large role in the success of the Port Credit Salmon and Trout Symposium held at Port Credit on April 10, 2011, and are helping to organize the Lake Ontario Information Sessions to be held at locations around the lake in April 2012. The council also helped develop and communicate a proposal to change Rainbow Trout catch and possession limits in Lake Ontario.

Other issues discussed included pen imprinting of Chinook Salmon, the development of a stocking strategy for Lake Ontario, the development of new fish community objectives for Lake Ontario, and the review of Regulations for Muskellunge and Black Bass (largemouth and smallmouth).

9.2 Lake Ontario and St. Lawrence River Commercial Fishing Liaison Committee

As shown in Section 4, Lake Ontario has several quota management zones in which Ontario Commercial License holders are licensed to harvest a wide variety of fish species. Aside from assessing fish stocks and allocating quota to the commercial fisheries, the Lake Ontario Management Unit (LOMU) also administers OCFLs, revises license conditions and assesses currency and quality of the Commercial Fishery Harvest Information System (CFHIS). During 2011, 10 OCFLs were retired bringing the number of licenses to just over 155 (across all quota zones). LOMU interacts directly with fishers through licensing, the Lake Ontario Liaison Committee (LOLC) and the Ontario Commercial Fisheries Association (OCFA).

The LOLC provides recommendations to the Lake Ontario Manager (Chair of Committee) regarding the commercial fisheries in Lake Ontario and the St. Lawrence River. The 2009-2011 LOLC ended its term during the year and as a result membership changed. The new committee has 16 members representing all management zones except for quota zone 1-8. Representatives from OMNR, guests including buyers/processors, and the OCFA can also attend LOLC meetings. The LOLC provides a forum for the Lake Unit and the commercial industry to discuss issues and fisheries management.

Including the Annual General Meeting (AGM), the LOLC met 4-times during 2011. LOMU representatives also attended the 2011 OCFA Convention. At each of these meetings, the Lake Ontario Management Unit heard and later acted upon several action items that were identified including simplifying and revising license conditions. Other topics discussed were northern pike management, Double-Crested Cormorants, the eel trap and transfer project, Walleye size restrictions and status of stocks, the pool system for in year quota management. New methods of fishing, particularly in quota zone 1-4 were also discussed. The year ended with a discussion about a commercial fishery management plan (CFMP) that would incorporate the upcoming Lake Ontario Committee Fish Community Objectives. The CFMP will be developed during 2012.

9.3 Fisheries Management Plans

(Available on-line at: http://www.mnr.gov.on.ca/en/Business/LetsFish/2ColumnSubPage/251350.html.)

Hamilton Harbour

The Hamilton Harbour and Watershed Fisheries Management Plan was adopted in 2010. The purpose of the Plan is to guide the sustainable management and use of the fish resources of the harbour and watershed. Plan implementation is now on-going. In 2011, Guelph District, through the Hamilton Wentworth Stewardship Council and district staff has worked with its partners in the planning, evaluation and removal of in-stream barriers on lower Spencer Creek. These barriers impede fish migration of Walleye, salmon, and trout to spawning areas, and degrade fish habitat.

Nine barriers were identified in Spencer Creek downstream form the Niagara Escarpment. The most downstream barrier on Spencer Creek, at Osler Drive in Dundas, was removed on July 21, 2011. A total of 764 fish, representing 30 species were relocated during the operation. Notable among these fish were 3 American Eel, and 102 Rainbow Trout, which confirmed the potential for coldwater species in lower Spencer Creek.

Bay of Quinte

The Ministry of Natural Resources along with stakeholder partners completed a fisheries management plan for the Bay of Quinte (BQFMP). The plan focused on the sustainable use of the fish communities in the Bay of Quinte and on improving communications among government agencies and stakeholders by providing a framework for coordinated and cooperative management. The BQFMP provides direction for the management of the fisheries resource in the Bay of Quinte and integrates with the goals and recommendations of both the Remedial Action Plan (RAP) for the Bay of Quinte and the Bay of Quinte Fish Habitat Management Plan (BQFHMP).

During the development of the BQFMP, performance targets were established for target species that could be used to evaluate management actions. The species targets were established as mean catches ± standard error from 2002-2006, and were thought to reflect the state of fish populations now that the population of walleye, the bay's dominant predator, has stabilized. Trawl data (Section 2.3) are used to track young of the year (YOY) fish abundance. NSCIN (Section 2.4) and gillnet data (Section 2.2) are used to track juvenile and adult fish abundance. Some gear types are better suited to monitor certain fish species, therefore, not every species had targets developed for all netting protocols.

In 2011, the performance targets were examined and compared to the target progress reported in 2008. As in 2008 most targets were met or exceeded. Yellow Perch catches in Bay of Quinte gillnets remain below target levels whereas Walleye catches in the Bay of Quinte and the outlet basin have exceeded target levels. Unlike 2008, catches of Smallmouth Bass in Bay of Quinte nearshore trap netting are below target levels however Largemouth Bass targets have been greatly exceeded and Northern Pike catches have increased slightly (Table 9.3.1).

TABLE 9.3.1. Progress on performance targets from the BQFMP. Arrows indicate whether 2011 index surveys exceeded, met, or failed to meet performance targets. N.A. designations indicate that the sampling gear does not sample the species of interest and was not used to establish a target. Initial NSCIN Targets were developed for both the upper and lower bay, however, limited sampling of the lower bay restricts this analysis to the upper bay only.

	YOY Lateral Trawls	NCSIN Upper Bay	Gillnets B of Q	Gillnets Outlet Basin
Walleye	↑	↔	↑	↑
Yellow Perch	↑	↑	↓	N.A.
Smallmouth Bass	N.A.	↓	N.A.	N.A.
Largemouth Bass	N.A.	↑	N.A.	N.A.
Northern Pike	N.A.	↑	N.A.	N.A.
River Redhorse	N.A.	↔	N.A.	N.A.

10. Research Activities

10.1 Ecology of *Hemimysis* in the Lake Ontario Ecosystem

Hemimysis anomala (hereafter referred to as *Hemimysis*), is a recent zooplankton invader that was first reported in the Great Lakes in 2006, and has subsequently spread through all of the Great Lakes (except Lake Superior), the St. Lawrence River, and several inland lakes in N.Y. state. Beginning in 2008, researchers at the Glenora Fisheries Station (in cooperation with researchers at Fisheries and Oceans Canada, Environment Canada, United States Geological Survey, St. Lawrence River Institute, Queen's University, the University of Waterloo, and the University of Windsor) sought to determine the potential impact of *Hemimysis* on the Lake Ontario food web. The first step in this process was to conduct a lake-wide survey to determine the geographical distribution and associated density of *Hemimysis*. A standardized methodology using replicate night-time vertical tows of a plankton net was developed and employed at piers in each of the spring, summer, and fall seasons (Fig. 10.1.1). Densities of *Hemimysis* were highly variable, and ranged from 0.3 m^{-3} to 1,817 m^{-3}, increasing throughout the year (Taraborelli et al. 2012). A west (high) to east (low) density gradient was apparent, with the highest density of *Hemimysis* at Bronte Harbour (seasonal mean 688.1 ±567.0 m^{-3}) and the lowest at locations in the Bay of Quinte (two individual *Hemimysis* were captured at Glenora in the fall of 2009, but no others have been detected further up in the bay; Fig. 10.1.1). Production estimates for *Hemimysis* (2.67-14.09 mg dry $weight \cdot m^{-2} \cdot d^{-1}$) were higher than those of other common zooplankton species, were greater in the warmer months, and multiple cohorts were produced throughout the year (at least three; Taraborelli et al. 2012). With this improved understanding of *Hemimysis* population dynamics, we sought to understand if and how *Hemimysis* might affect the resident food webs at various locations in Lake Ontario. Laboratory experiments were initiated that suggested Yellow Perch select *Hemimysis* over traditional invertebrate prey, supporting our expectation that fish should consume this new food source. Intensive field sampling of the entire food web, from plankton to top predators, in each season at four locations spanning the density gradient of *Hemimysis* (Bronte, Cobourg, Waupoos, Bay of Quinte) allowed us to document which organisms might be affected by *Hemimysis* and to what degree. Visual examination of fish stomachs revealed approximately 2% of fish consumed *Hemimysis*, representing 9 of 41 species examined. This rate of predation on *Hemimysis* was lower than expected, especially for species such as Alewife, known to prey on native mysids, and reported to feed heavily on *Hemimysis* by other researchers. We hypothesized that *Hemimysis* might be subject to rapid digestion, owing to their small size. We therefore evaluated digestion rate in the laboratory under controlled conditions of temperature and *Hemimysis* size. *Hemimysis* were completely digested within four hours of being consumed by a fish, with even shorter digestion times at warmer water temperatures and for smaller *Hemimysis*. These results suggested that accurate characterization of fish feeding on *Hemimysis* would require additional analyses beyond traditional stomach content examination. First, a *Hemimysis*-specific molecular probe was developed that searches for DNA of *Hemimysis* in fish diets, even when gut contents are highly digested. This probe revealed that *Hemimysis* were consumed by fish with greater frequency than was visually detected. A separate technique used stable isotopes of carbon and nitrogen to characterize predator-prey linkages and fish dietary preference (Fig. 10.1.2). The isotope analysis revealed that *Hemimysis* were being incorporated into fish diets (despite our low visual detection rate in fish stomachs), that the rate of incorporation varies with fish species, and that fish reliance on *Hemimysis* as a dietary component increased with *Hemimysis* density (Yuille et al. 2012). The final phase of the project is to use models to explore potential consequences to fishes including effects on growth, fitness, and contaminant biomagnification. Analyses are underway to describe differences in fish condition and health across the *Hemimysis* gradient described above. Bioenergetic models have been used to estimate

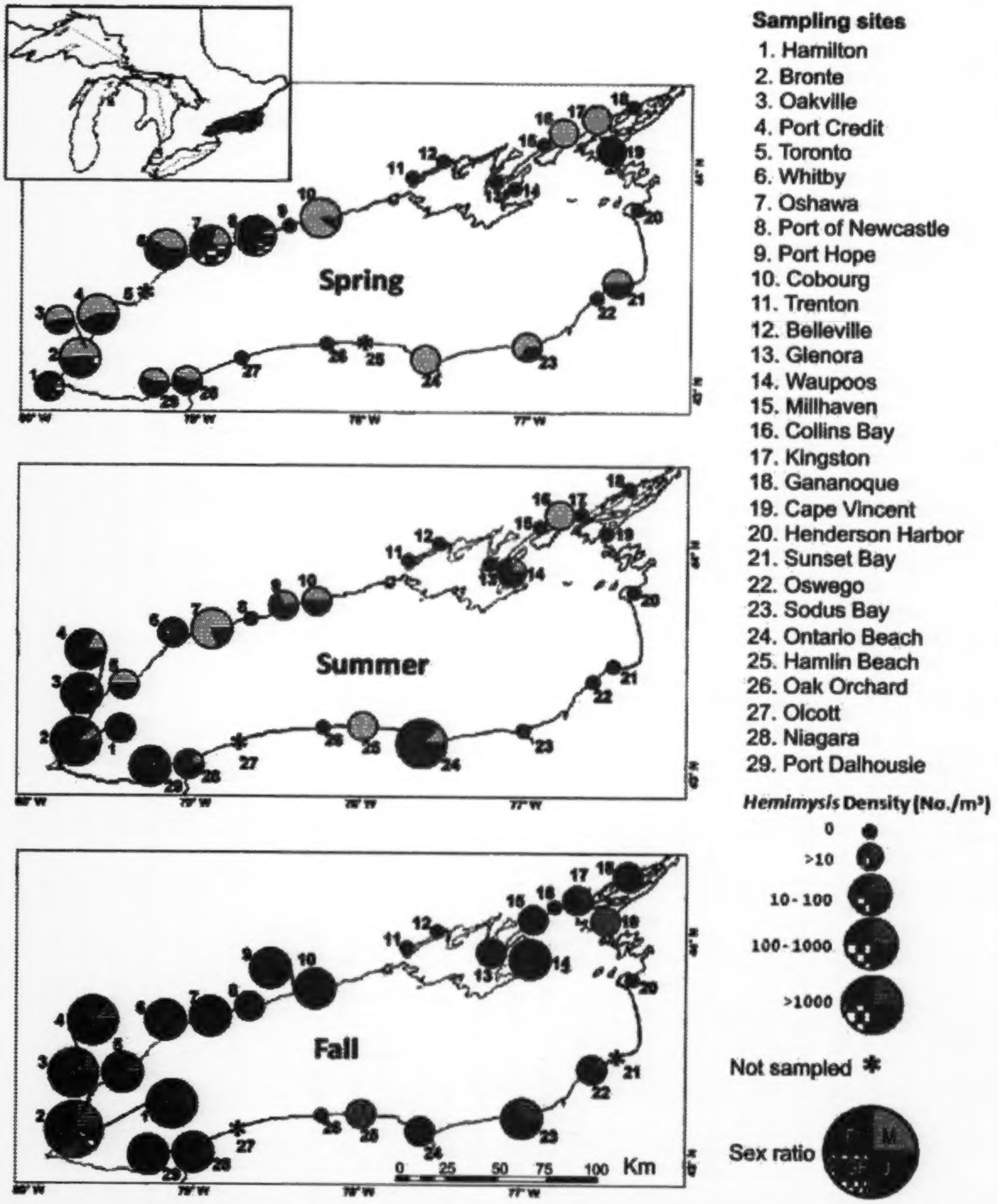
Spring
Summer
Fall
Sampling sites
1. Hamilton
2. Bronte
3. Oakville
4. Port Credit
5. Toronto
6. Whitby
7. Oshawa
8. Port of Newcastle
9. Port Hope
10. Cobourg
11. Trenton
12. Belleville
13. Glenora
14. Waupoos
15. Millhaven
16. Collins Bay
17. Kingston
18. Gananoque
19. Cape Vincent
20. Henderson Harbor
21. Sunset Bay
22. Oswego
23. Sodus Bay
24. Ontario Beach
25. Hamlin Beach
26. Oak Orchard
27. Olcott
28. Niagara
29. Port Dalhousie
Hemimysis Density (No./m³)
0
>10
10-100
100-1000
>1000
Not sampled *
Sex ratio
F
M
GF
J
0
25
50
75
100
Km
80° W
79° W
78° W
77° W

FIG. 10.1.1. Distribution and density of *Hemimysis* across Lake Ontario during spring, summer, and fall of 2009; F = female, M = male, GF = gravid female, J = juvenile. Reproduced from Taraborelli et al. 2012.

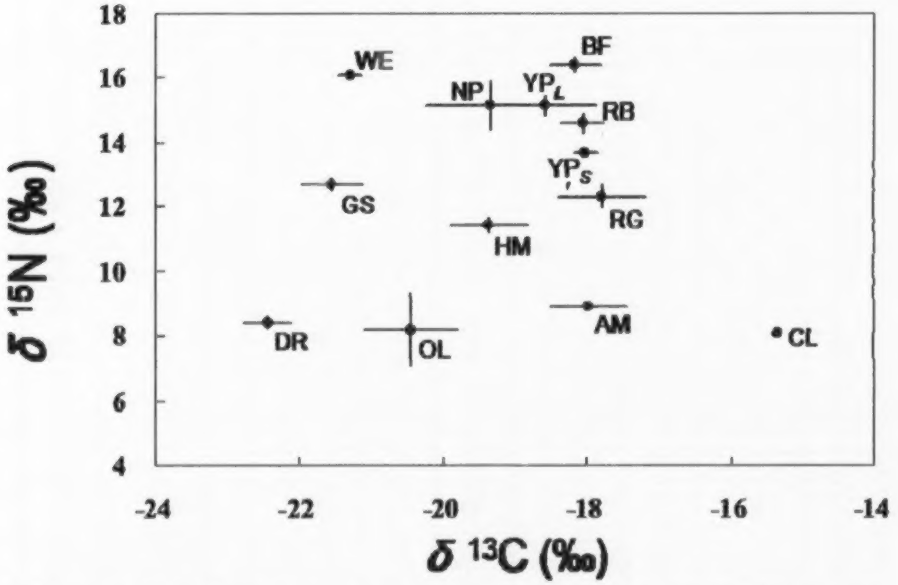

FIG. 10.1.2. Nearshore food web structure at Waupoos (eastern Lake Ontario) in the fall of 2009 based on stable isotopes of carbon and nitrogen DR = Dreissenid, OL = Oligochaete, AM = Amphipod, CL = Cladophora, HM = Hemimysis, RG = Round Goby, GS = Golden Shiner, YP$_S$ = Yellow Perch (small), YP$_L$ = Yellow Perch (large), RB = Rock Bass, NP = Northern Pike, WE = Walleye, BF = Bowfin.

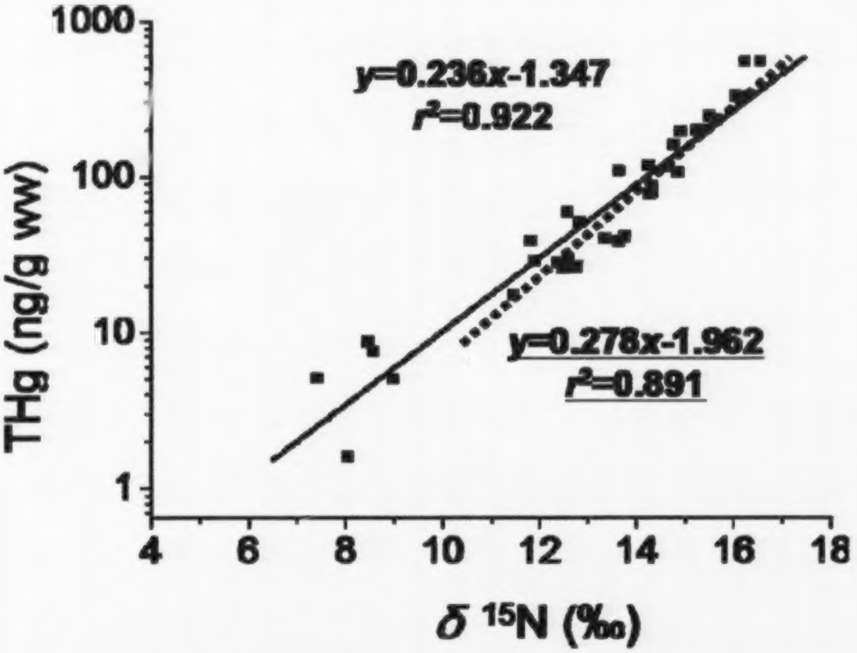

FIG. 10.1.3. Total mercury concentration (THg) versus trophic level ($\delta^{15}N$) for organisms from the littoral Lake Ontario food web of Waupoos (fall), 2009. Solid line represents the regression between d15N and THg of "entire" food web (log Hg-d15N regression equations in the upper left hand corner in each plot), and dashed line represents the regression between d15N and THg of "fish-only" food web (log Hg-d15N regression equations in the lower right hand corner of each plot). Note that the y-axis is untransformed Hg concentrations plotted along a logarithmic scale, while the equations are based on log-transformed Hg values.

impacts on fish growth rate potential under different scenarios of *Hemimysis* abundance. Preliminary results suggest *Hemimysis* is an energetically inferior prey to most organisms consumed by Yellow Perch, and under all but the highest densities of *Hemimysis*, fish growth rate potential will decline if resident prey (zooplankton, benthic invertebrates) become less abundant in fish diets. Contaminant analysis has shown that total mercury concentration (a chemical of concern in fish consumption advisories) is highly correlated with nitrogen isotope values (an estimate of trophic position, with top predators having elevated nitrogen isotope values relative to their prey; Fig. 10.1.3). This rate of biomagnification varies seasonally within a site (Zhang et al. 2012), and preliminary results suggest consumption of *Hemimysis* could increase contaminant accumulation in some offshore fish species, but will have little effect on nearshore fishes where *Hemimysis* is most abundant (Zhang, unpublished results). As our research program on *Hemimysis* winds down, our work has shown *Hemimysis* can reach very high density in some locations, that they are likely to be consumed by fishes, that in most cases fish growth would be expected to decline if *Hemimysis* replaced current prey in the diet, and that *Hemimysis* has a low likelihood of affecting contaminant dynamics of fish species they would most likely interact with.

Taraborelli, A., N. Jakobi, T. Johnson, K. Bowen, and B. Boscarino. 2012. Distribution, abundance and production of *Hemimysis anomala* in Lake Ontario. Journal of Great Lakes Research (in press).

Yuille, M., T. Johnson, S. Arnott, and L. Campbell. 2012. *Hemimysis anomala* in Lake Ontario food webs. Journal of Great Lakes Research (in press).

Zhang, L., L. Campbell, and T. Johnson. 2012. Seasonal variation in mercury and food web biomagnifications in Lake Ontario, Canada. Environmental Pollution 161: 178-184.

10.2 Lake Trout Response to Ecological Change in Lake Ontario

Collaborators: Ontario Ministry of Natural Resources (Aquatic Research and Development Section, and the Lake Ontario Management Unit), University of Windsor, Fisheries and Oceans Canada, Environment Canada, U.S. Geological Survey, New York State Department of Environmental Conservation

Lake Trout is one of only two native salmonines in Lake Ontario and has historically played a pivotal role in energy cycling in the offshore and exerting a stabilizing influence on the fish community. Overfishing and Sea Lamprey predation extirpated Lake Trout from Lake Ontario by the 1950s, and subsequent rehabilitation efforts through stocking remain plagued by poor survival and little evidence of natural reproduction. Current impediments to rehabilitation include changes in the quantity and quality of prey associated with on-going proliferation of non-indigenous species. We carried out an intensive assessment of feeding ecology and health of Lake Trout collected from a 2008 lake-wide survey of Lake Ontario using traditional fisheries measures and novel chemical tracers (stable isotopes, fatty acids, persistent organic pollutants). We found fundamental changes in the ontogenetic relationship and overall source of carbon and health of Lake Trout between 2008 and the 1990s (see 2010 annual report for summary findings). These changes appear to be driven by a diversion of carbon/nutrients from the pelagic to the benthic habitat and may relate to changes in forage fish abundance. Such a fundamental change in trophic pathways needs to be understood if top predator health is to be maintained in the Great Lakes. However, to evaluate these changes, a more complete retrospective analysis of food web structure is needed. In 2011, Lake Trout and prey species samples dating back to the late 1970s were obtained from the National Aquatic Biological Specimen Bank for analysis of stable isotopes (to characterise general patterns in food web structure), fatty acids (to enhance the resolution of predator-prey interactions), and PCBs (to quantify activity and feeding rates of

Lake Trout). Interpretation of these historic samples is currently underway and will be presented at the 55th Annual Conference on Great Lakes Research in May 2012. While we await these findings, we have also undertaken analyses to understand the latency of a hatchery signal in Lake Trout, needed for us to accurately interpret results of these chemical tracers. Our earlier analyses of tissue samples from 2008 revealed young Lake Trout (<250 mm) had strongly different carbon isotope values from larger (older) Lake Trout and we needed to verify this was not related to the strong marine signal related to hatchery feed (ocean fish, the basis of the animal protein in fish feed, has a very different carbon isotope value than freshwater prey fish). Using sulphur isotopes, in addition to carbon and nitrogen, we were able to show non-hatchery derived food sources (i.e., freshwater prey fish) were integrated into the fish's tissue between 1 and 3 months post-release, and hatchery feed does not explain the different isotopic signatures observed in young Lake Trout. Fatty acid profiles (Fig. 10.2.1), in addition to the carbon isotope values, were used to determine that all ages of Lake Trout currently rely more heavily on nearshore prey, including Round Goby, when compared to Lake Trout from the 1990s, with the dependency more pronounced for younger individuals (Fig. 10.2.2). The retrospective modelling analyses will determine if the change in Lake Trout habitat use and behaviour associated with feeding on Round Goby reflects a substantial shift in the species' bioenergetics, and thus, has long-term implications for Lake Trout health, reproduction, and population stability.

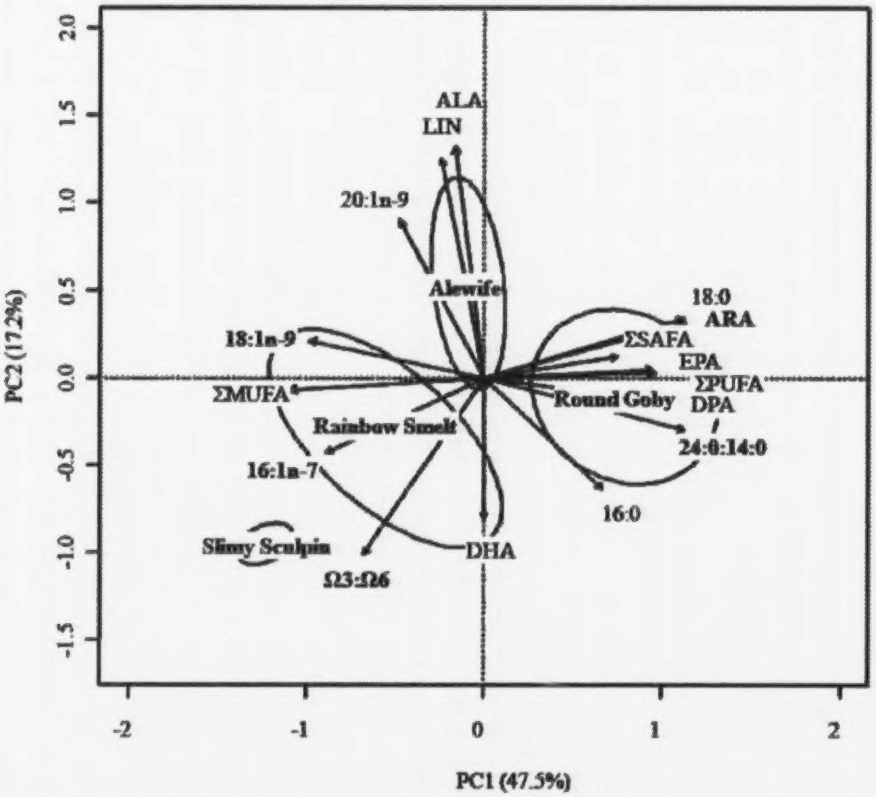

FIG. 10.2.1. PCA biplot depicting component scores for fatty acid proportions measured in prey fish collected from Lake Ontario during fall 2008. Ellipses around prey fish species reflect 95% confidence intervals. Individual fatty acids and ratios separating species by habitat and diet include 18:1n-9 (a marker of declining temperature), 16:1n-7 (highest among fish that consume diatoms), the ratios of fatty acids 24:0 (allochthonous energy sources originating outside the system, e.g., leaf litter from watershed) to 14:0 (autochthonous = energy produced within the system e.g., phytoplankton), and Ω3:Ω6 (reflecting nearshore vs. pelagic sources).

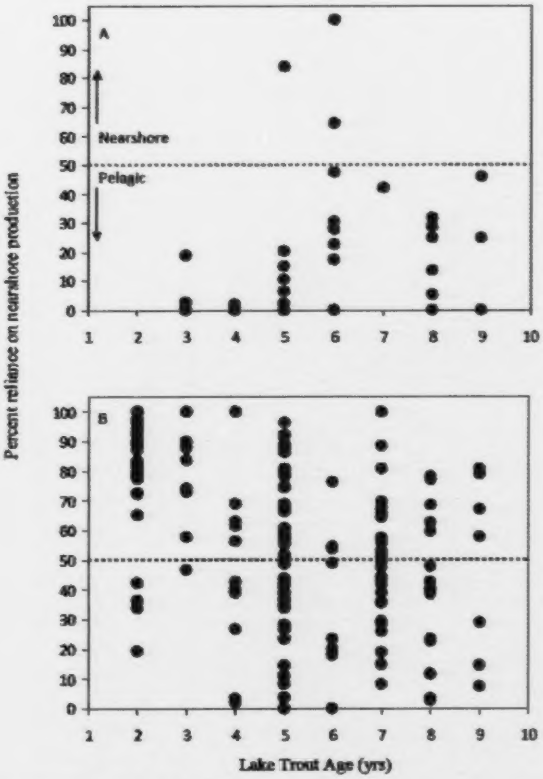

FIG. 10.2.2. Predicted contributions of nearshore and pelagic carbon resources for Lake Ontario Lake Trout collected in (A) 1992, and (B) 2008.

10.3 Project Quinte

Project Quinte is a co-operative, multi-agency. research and monitoring project between federal (Department of Fisheries and Oceans) and provincial governments (Ontario Ministry of Natural Resources) that has investigated the long-term effects of the reduction in point-source phosphorus loadings, food-chain influences and zebra mussel colonization on the trophic dynamics of the entire Bay of Quinte ecosystem. Early research efforts were published in a special issue of the Canadian Journal of Fisheries and Aquatic Sciences entitled Project Quinte: Point-Source Phosphorus Control and Ecosystem Response in the Bay of Quinte, Lake Ontario (1986).

In 2011, the members of Project Quinte published a special issue in Aquatic Ecosystem Health & Management entitled "Ecosystem Health and Recovery of the Bay of Quinte, Lake Ontario". The issue consisted of 11 papers with a wide range of topics including: historical conditions, climate change, lower trophic levels, higher trophic levels, contaminants and management. A second Bay of Quinte focused special issue is planned for 2012.

10.4 Eastern Lake Ontario Limnology (Station 81)

In 2011, OMNR's Aquatic Research and Development Section (ARDS) and Lake Ontario Management Unit (LOMU) continued to partner with Fisheries and Oceans Canada to collect information on lower trophic levels of Lake Ontario's aquatic community. This multi-agency partnership facilitates regular bi-weekly sampling at Station 81 (44° 01.02' N, 76° 40.23' W; 38 m water depth), a historic sampling site situated in the approximate centre of Lake Ontario's eastern basin. Measurements made at this location are used to describe the lake's physical limnology (e.g., water temperature, dissolved oxygen, water transparency), primary production (e.g., algal and microbial composition and abundance), and secondary production (e.g., zooplankton and benthic invertebrates). Preliminary examination of the data (2007-2010) suggest that potential productivity is greater in recent years (2009, 2010; Table 10.4.1). This is likely due to an increase in algal biomass, as indirectly indicated by the chlorophyll measures and slightly higher surface temperature (Table 10.4.1). However, the relative increase in production falls within an expected range of year-to-year variability, and remains much lower than in nearby Bay of Quinte. In that same time period (2007-2010), seasonal mean zooplankton densities in the warm, upper layer of the lake (excluding dreissenid veligers larvae) have ranged between 5,001 and 6,187 individuals · m^{-3} (Fig. 10.4.1). This represents a dramatic drop relative to the 1981 to 1995 time period, when values were at least an order of magnitude higher (earlier values ranged from 45,589 individuals · m^{-3} in 1988, to 144,750 individuals · m^{-3} in 1983). Much of the decline is associated with loss of cladocerans (-93%) and cyclopoid copepods (-97%), while calanoid

TABLE 10.4.1. Select limnological parameters measured in the eastern basin of Lake Ontario (Station 81), 2007-2010. Mean, standard error, and sample size are shown.

	2007 May-Oct	2008 May-Aug	2009 May-Oct	2010 May-Oct
Secchi Depth (m)	7.95 (±0.87, 11)	8.71 (±1.20, 7)	6.91 (±0.88, 11)	6.75 (±0.81, 11)
Surface Temperature (°C)	16.08 (±1.43, 12)	13.73 (±2.48, 8)	16.98 (±1.43, 11)	17.65 (±1.50, 11)
Total Phosphorus (mgL^{-1})	0.0216 (±0.003,11)	0.0114 (±0.001, 8)	0.0109 (±0.001,10)	0.0103 (±0.001,10)
Chlorophyll *a*, uncorrected (μgL^{-1})	1.66 (±0.292, 12)	1.65 (±0.41, 8)	2.29 (±0.29, 10)	2.28 (±0.35, 10)
Potential Productivity (mg C m^{-3} hr^{-1})	2.55 (±0.44, 12)	2.00 (±0.26, 7)	5.46 (±1.13, 10)	4.82 (±0.91, 10)

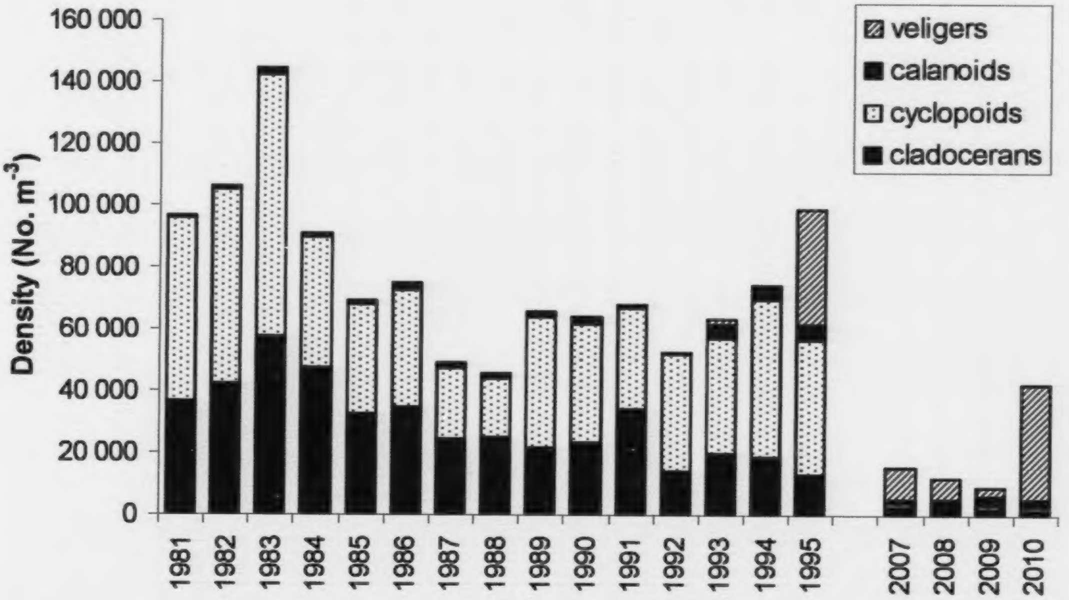

FIG. 10.4.1. Seasonal mean density (number m^{-3}) of dominant zooplankton groups in the epilimnion at Station 81, from 1981-1995 and 2007-2010. Means represent early-May to late-October period.

copepods remain comparable between the 1981-1995 and 2007-2010 time stanzas (Fig. 10.4.1). Dreissenid veliger larvae (first appeared in the plankton samples in 1993) were most abundant in 2010, when the epilimnetic seasonal mean was 36,908 individuals · m^{-3}, or about 80% of the total mean zooplankton density. As aquatic invasive species, climate change, and other large ecological phenomena continue to change the dynamics of the Lake Ontario food web, regular monitoring of the limnology and lower trophic levels such as is occurring at Station 81 provide scientists with critical information to describe and more accurately predict the future state of the lake's fishery and overall ecosystem health.

11. Partnerships

11.1 St. Lawrence River Seine Netting and Muskellunge Nursery Site Identification

The "Update of the Strategic Plan for Management of the St. Lawrence River Muskellunge Population and Sport Fishery Phase III: 2003-2010" includes the objective of protection of muskellunge spawning and nursery habitats. These habitats are not well documented or identified within the St. Lawrence River. OMNR conducted a young of-the-year seining program from 1989-1995 in an effort to identify nursery sites within the Canadian waters of the St. Lawrence River. Efforts were discontinued following this period. During 2005-2011, efforts to identify muskellunge nursery habitats were renewed through a partnership between Muskies Canada Inc. (MCI – Gananoque Chapter), Parks Canada (St. Lawrence Islands National Park), Kemptville District MNR, Fisheries and Oceans Canada (Prescott), and the Lake Ontario Management Unit (LOMU).

Final results for 2011 were not available at the time this report was printed. The on-line version of this report will be updated to include these results when they become available.

12. Staff 2011

PROVINCIAL SERVICES DIVISION

Fish and Wildlife Services Branch—Lake Ontario Management Unit

Andy Todd – Lake Manager
Linda Blake – Administrative Assistant
Alastair Mathers – Lake Ontario COA Coordinator
Bruce Morrison – Assessment Supervisor
Tom Stewart – Program Advisor Great Lakes Ecosystems
Jim Bowlby – Assessment Biologist, Lake Ontario COA Coordinator (Acting)
Jim Hoyle – Assessment Biologist
Ted Schaner – Assessment Biologist
Marc Desjardins – Management Biologist
Marion Daniels – Management Biologist (Peterborough)
Colin Lake – Operations Supervisor, Assessment Supervisor (Acting)
Kelly Sarley – Database Technician Computer Operator
Dale Dewey – Operations Coordinator, Operations Supervisor (Acting)
Wayne Miller – Senior Technician Base Operations
Jon Chicoine – Vessel Master
Dave Goodfellow – Great Lakes Technician
Tom Lawrence – Great Lakes Technician
Angela Adkinson – Lake Ontario Aquatic Ecologist Intern
Alan McIntosh – Boat Captain
Gord Meadows – Great Lakes Fisheries Technician
Tim Dale – Great Lakes Fisheries Technician
Megan Davies – Great Lakes Fisheries Technician
Evan Hall – Great Lakes Fisheries Technician
Derek Lipskie – Great Lakes Fisheries Technician
Sonya McMillan – Great Lakes Fisheries Technician
Kurtis Plourde-Rideout – Great Lakes Fisheries Technician
Tyson Scholz – Great Lakes Fisheries Technician
Megan Smith – Great Lakes Fisheries Technician
Deborah Silver – Great Lakes Fisheries Technician
Shane Wood – Great Lakes Fisheries Technician
Jeremy Courtney – Student Fisheries Technician
Mary Hanley – Student Fisheries Technician
Scott King – Student Fisheries Technician
Paul (Dan) Mercer – Student Fisheries Technician
Eric McConnell – Student Fisheries Technician

Enforcement Branch

Matt Orok – Enforcement Supervisor, Lake Ontario
Kristi Lowe – Conservation Officer
Kyle Wood – Conservation Officer
Edwin Van Den Oetelaar – Conservation Officer
David Hall – Conservation Officer (Acting)
Geoffrey Denyes – Intern Conservation Officer

Randy Tippin – Conservation Officer (Vineland)
Rick Andrews – Conservation Officer (Aurora)

SCIENCE AND INFORMATION RESOURCES DIVISION

Applied Research and Development Branch

Dr. Tim Johnson – Research Scientist
Brent Metcalfe – Research Biologist
Nina Jakobi – Research Technician
Sonya McMillan – Research Technician
Gord Meadows – Research Technician
Carolina Taraborelli – Research Technician
Brittany Yuill – Student Research Technician, Research Technician

Science and Information Branch

Les Stanfield – Senior Research Biologist

13. Operational Field and Lab Schedule, 2011.

Field or lab project	Dates	Species assessed, monitored or stocked	Number of years	Lead biologist	Funding source
Ganaraska Fishway Rainbow Trout Assessment	Apr 4-29	Adult Rainbow Trout	38	Bowlby	
Credit River Atlantic Salmon Smolt Assessment	Apr 7-Jun 16	Atlantic Salmon	1	Desjardins	COA
Chinook Salmon Parr Marking (coded wire tags, fin clips)	Apr 20-30	Chinook Salmon	2	Daniels	
Lake Trout Tug Stocking	Apr 18-May 6	Juvenile Lake Trout	n/a	Daniels	
Station 81: Offshore Benthos and Zooplankton Survey	May 2-Sep 19	Lower food web	n/a	Dr. Johnson	COA
Commercial Catch Sampling	Seasonal	Lake Whitefish	26	Hoyle	
American Eel Trap and Transfer	May-June	American Eel	5	Mathers	
Moses Saunders Eel Ladder Monitoring	May-Oct	Migrating American Eel	38	Mathers	COA
Eastern Lake Ontario and Bay of Quinte Community Index Netting	Jun 27-Sep 2	Multiple species including Walleye and Lake Whitefish	54	Hoyle	
Lake-wide Hydroacoustic Assessment of Prey Fish	Jul 25-29	Alewife, Rainbow Smelt, *Mysis*	21	Schaner	
Adult Atlantic Salmon Assessment - Credit River & Cobourg Creek	Aug 23-Nov 25	Atlantic Salmon	1	Daniels	
Upper Bay of Quinte Nearshore Community Index Netting	Sep 6-23	Multiple species including centrachids, Walleye and Pike	10	Hoyle	COA
Lower Bay of Quinte Nearshore Community Index Netting	Sep 6-23	Multiple species including centrachids, Walleye and Pike	6	Hoyle	COA
Wolfe Island - Submarine Cable Impact Study	Sept 6-16	Nearshore and pelagic fish communities	n/a	Dr. Dunlop	
St. Lawrence River Fish Community Index Netting - 1000 Islands	Sep 12-30	Walleye, Yellow Perch, Northern Pike	27	Schaner	COA
Chinook Salmon Mark/Tag Monitoring and Creel Survey	Jun 3-Sep 8	Chinook Salmon	2	Bowlby	
Nearshore-Offshore Linkage Study	Sep 19-30	Multiple species	1	Dr. Stewart	COA
Credit River Chinook Assessment and Egg Collection	Oct 3-7	Mature Chinook Salmon	42	Bowlby	
Credit River Juvenile Atlantic Salmon Electrofishing	Oct 3-21	Atlantic Salmon	5	Bowlby	COA
Age and Growth	Year-round	Multiple species	n/a	Multiple	

14. Primary Publications of Glenora Fisheries Station Staff[1] in 2011

Brousseau, C.M., Randall, R.G., **Hoyle, J.A.**, Minns, C.K. 2011. Fish community indices of ecosystem health: How does the Bay of Quinte compare to other coastal sites in Lake Ontario? Aquat. Ecosyst. Health Mgmt. 14:75-84.

Bowlby, J.N., Hoyle, J.A. 2011. Distribution and movement of Bay of Quinte walleye in relation to temperature, prey availability and dreissenid colonization. Aquat. Ecosyst. Health Mgmt. 14: 56-65.

Bowlby, J.N., Savoie, P.J. 2011. Verifying identification of salmon and trout by boat anglers in Lake Ontario. N. Amer. J. Fish. Manage. 31: 468-473.

Carreon-Martinez, L., **Johnson, T.B.**, S.A. Ludsin, and D.D. Heath. 2011. Utilization of stomach content DNA to determine diet diversity in piscivorous fish. J. Fish Biol. 78: 1170-1182.

Currie, W.J.S., Cuddington, K., **Stewart, T.J.**, Zhang, H., and Koops, M.A. 2011. Modelling spread, establishment and impact of Bighead and Silver carps in the Great Lakes. Can. Sci. Adv. Sec. Res. 2011/113: vii + 71 p.

Hoyle, J.A., Johannsson, O.E., Bowen, K.L. 2011. Larval Lake Whitefish abundance, diet and growth and their zooplankton prey abundance during a period of ecosystem change on the Bay of Quinte, Lake Ontario. Aquat. Ecosyst. Health Mgmt. 14: 66-74.

Hoyle, J.A., Lake, C. 2011. First Occurrence of Chain Pickerel (*Esox niger*) in Ontario: possible range expansion from New York waters of eastern Lake Ontario. Can. Field-Nat. 125: 16-21.

Mezek, T., Sverko, E., Rudy, M.D., Zaruk, D., Hebert, C.E, Fisk, A.T., McGoldrick, D.J., Newton, T.J., Sutton, T.M., Koops, M.A., Muir, A.M., **Johnson, T.B.**, Ebener, M.P., Arts, M.T. 2011. Polymethylene-interrupted fatty acids: biomarkers for native and exotic mussels. J. Great Lakes Res. 37: 289-297.

Nicholls, K.H., **Hoyle, J.A.**, Johannsson, O.E., Dermott, R. 2011. A biological regime shift in the upper Bay of Quinte ecosystem (Lake Ontario) associated with the establishment of invasive dreissenid mussels. J. Great Lakes. Res. 37: 310-317.

Stewart, T.J., Sprules, W.G. 2011. Carbon-based balanced trophic structure of the offshore Lake Ontario food web before (1987-1991) and after (2001-2005) invasion-induced ecosystem change. Ecological Modelling 222: 692-70.

[1] – Names of staff of the Glenora Fisheries Station are indicated in **bold** font.

50968
(0.275 k P.R., 12 03 16)
ISSN 1201-8449